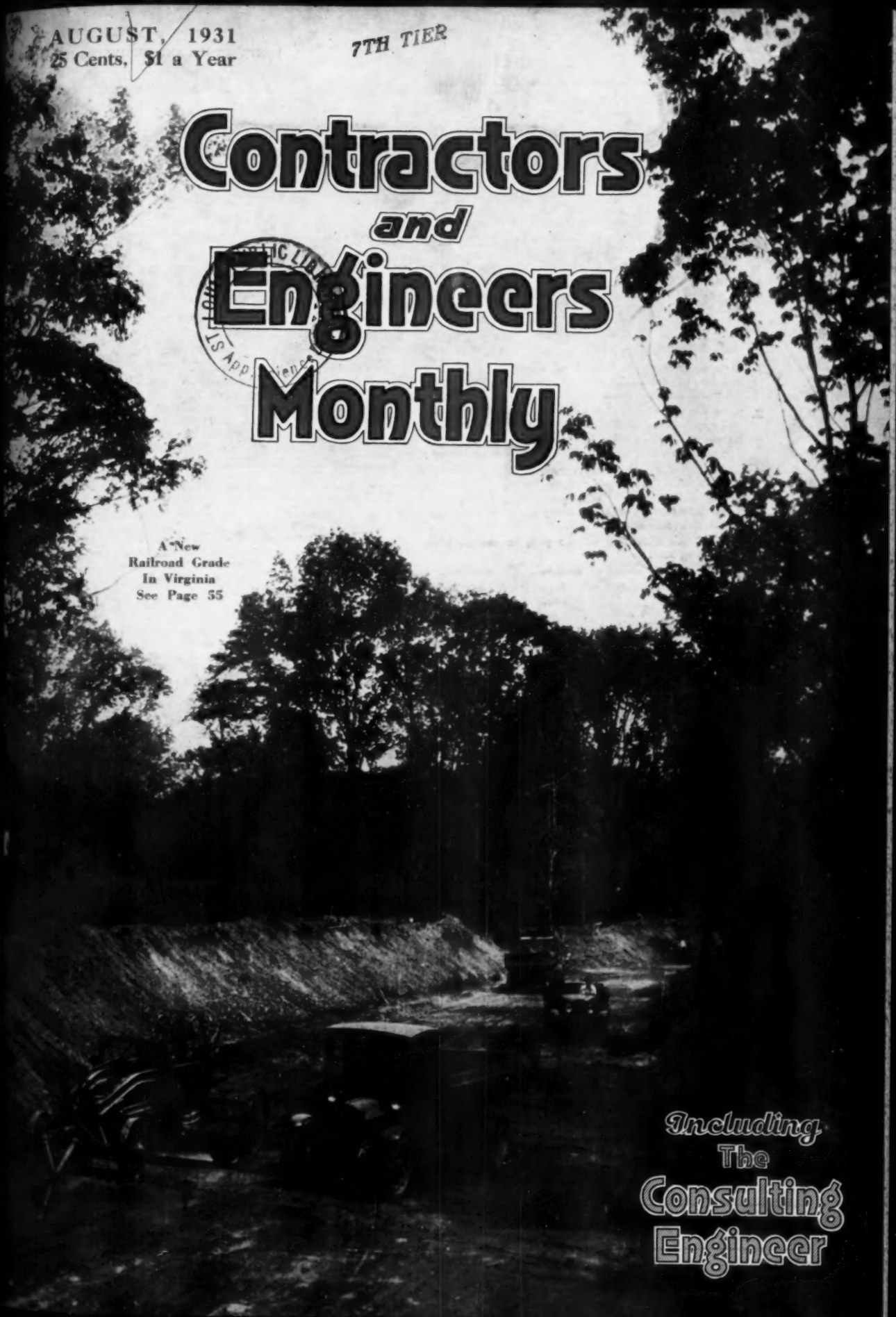
AUGUST, 1931
25 Cents, $1 a Year

7TH TIER

Contractors and Engineers Monthly

A New
Railroad Grade
In Virginia
See Page 55



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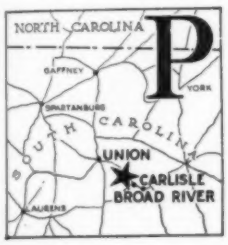
Materials *for* 14.7-Mile Concrete Job Batched *from* Three Locations

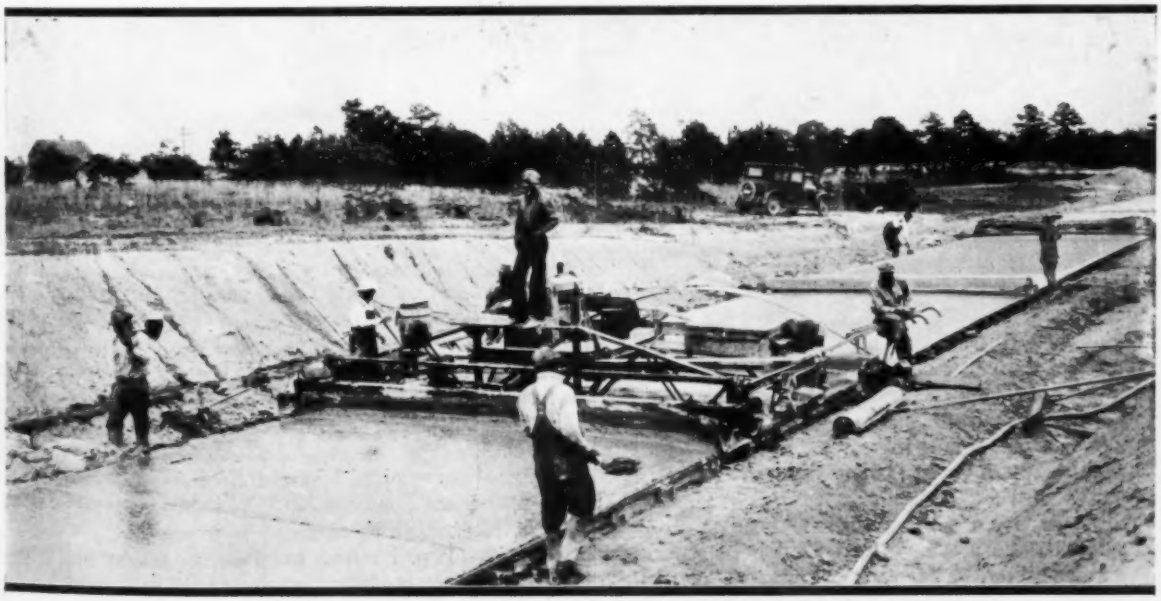
R. G. Lassiter & Co. Ran One Mile a Week Between Union and Carlisle, South Carolina



PEP, and it should be spelled with three capital letters, is seen on any Lassiter job but the 14.7-mile concrete job which was run from Union to Carlisle, S. C., last summer showed pep from the Superintendent right down to the water boy. Perhaps the fine grade gang that jumped, not pushed, the grade board behind the paver had the most pep of any single unit of the outfit. When the paver moved forward those four boys let out a yell and the grade board slid along the forms so fast that a still camera was useless to record the feat. It took pep to run 1 mile of concrete a week with the 18-foot slab and a 7½-6-7½-inch section on the firm subgrade and an 8-6½-8-inch section on all fills.

All Fills Jetted Before Paving

In order to secure the most compact fills for the concrete slab the State specifications required that the con-



The Lakewood Screed Making Its Second Pass Over the Slab. Hand-Finishing Operations in the Background

tractor jet all fills over 5 feet in depth. As the fills ran from 5 to 30 feet in depth there was plenty of jetting on the job. About 80,000 cubic yards of fill was jetted under 60 pounds pressure, the jets being forced down every 5 feet along the line of the roadway and transversely.

All of the drainage structures were handled by a subcontract. The job was about 75 per cent relocation.

A Minimum of Labor on the Fine Grade

The entire work on the rough grade for this project was done under a subcontract by W. B. Boyle & Co., of Sumpter, S. C. The rough grade was left in good shape for the contractor to put on his forces with a minimum of man-power and quickly produce a fine subgrade for the concrete slab.

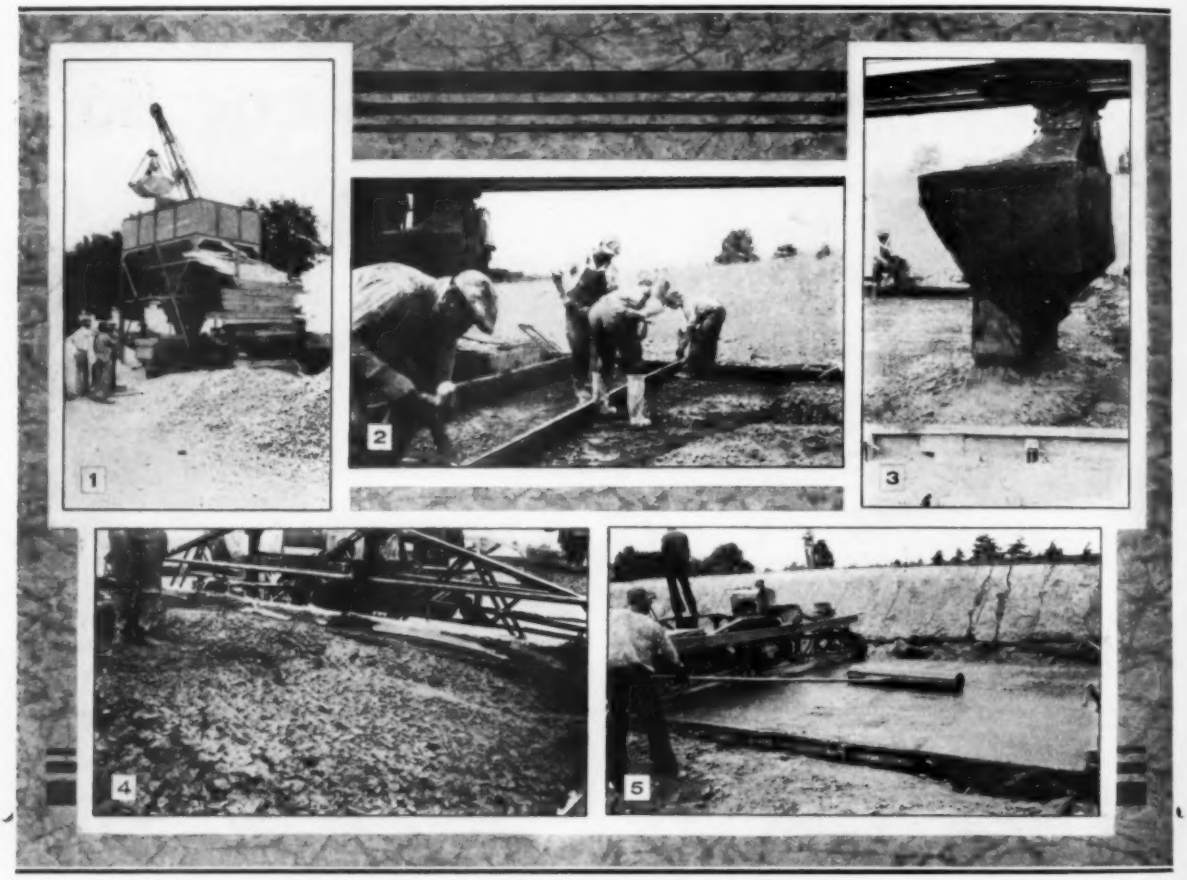
The equipment on the fine grade included a Caterpillar Sixty and an Adams leaning wheel grader with a 12-foot blade, a Lakewood subgrader and a Lakewood grade-rooter, as well as a 10-ton Huber gas roller for compacting the grade where it had been scarified by the grade-rooter. The labor organization consisted of 1 foreman, 1 tractor operator, 1 road machine man, 1 roller man, 2 form setters, 1 form liner, 8 laborers, and 1 driver for a team and scraper which worked behind the subgrader. A total of 1,800 feet of Lakewood forms were used on the job.

In the list of equipment the service truck should not be omitted, for it hauled everything from laborers to gas, oil, center strip, parts or what have you.

Preparing the Batches

Seven men made up the crew that sent out the batches to the paver on the road. They were a crane man and an oiler for the Lorain 55 with a 1-yard Owen clamshell bucket which unloaded the sand and stone and loaded the Butler bins and batchers, 2 men in the cars, 1 batcher man, and 2 men to open the cement bags and toss them into the bottom of the trucks before the aggregate was put in. Six bags of cement went into the batches.

Sand was received by rail from S. W. Wilson & Sons, and from the Southern Silica M & M Co., both of Dixiana, S. C. The stone came from the South Carolina Granite Corp. quarries at Blair, S. C., by rail. The batches were made up by weight using an average of 2,160 pounds of stone and 1,080 pounds of dry sand corrected for moisture content. One man was employed



MACHINES AND MEN PRODUCE SMOOTH RIDING SLAB EFFICIENTLY AND SPEEDILY

1. The batching plant, comprising a Lorain 55 crane, Butler bins and weighing batchers, and one of the fleet of United trucks. 2. Setting an expansion joint with a steel bulkhead cut to the contour of the slab. 3. Spreading a batch with the bucket of the Rex 27-E paver. 4. The first pass of the Lakewood screed. 5. Using a Macon roller to remove any excess water worked to the top after the second pass of the screed.

at the batcher plant baling the bags which were brought back by each of the hauling trucks with the five bags stuffed into the sixth.

SEQUENCE OF PAVING

The paving job ran from Union, 4.7 miles to Carem, then 4 miles to Santuc, another 4 miles to Carlisle and 2 miles beyond to Broad River. Paving was started with the batchers set up at Carlisle from which the slab was poured from Broad River 2 miles back to Carlisle and the 3 miles closer to Carlisle on the Santuc side. The batching plant was then set up at Santuc and the slab from 3 miles beyond Santuc paved and then the remaining mile between Santuc and Carlisle. The plant was then moved to Carem and the 4.7 miles from Union to Carem poured and the job closed with the paving of the last mile toward Santuc working toward the plant.

THE SECRET OF REVERSING THE TRUCKS AT THE BATCHER

At the batchers it was noted that the trucks drove in under the batchers one time and the next time they backed under. The reason for this method is interesting. Because of the high wind which existed the cement was thrown on the bottom of the batches with the sand and stone on top. The sand was damp and if dumped in the same spot each time there was a tendency for the cement to stick and finally set up. By reversing the trucks each time the dampness was distributed and taken up by the other materials, eliminating the sticking of the cement and saving labor in dumping the batches at the paver.

The hauling of the batches was done by subcontract by the A. G. Boone Co., using United trucks equipped with Wood hydraulic hoists.

POURING THE SLAB

The batch trucks were turned on a Blaw-Knox turntable just ahead of the paver by a man allotted to that work. The trucks then backed to the skip and were directed by a man who also tripped the board between the two batches. The remainder of the concreting organization were: 1 foreman, 2 men to empty the sacks, 1 oiler for the paver who also oiled the forms, the operator for the 27-E Rex paver, 4 grade board men, the original pep boys who sang and shouted at their work, 3 concrete shovelers who also spaded at the forms and shoveled to the Lakewood finisher as needed, 2 finishers for the slab who hand-floated, used the Lakewood straightedge, Macon roller and arched canvas belt.

Expansion joints were inserted in the slab every 40 feet by the grade board men using a joint template of steel cut to the contour of the slab and turned over 1 inch at the top to protect the expansion material from the screed of the finisher.

The 155,232 square yards of concrete slab were placed for $1.55 per square yard for the 7½-6-7½ section and $1.64 for the 8-6½-8 section while the 130,000 cubic yards of excavation were moved for 32 cents per cubic yard. The State specifications required a 1½-minute mix for the concrete. The average day's run was from 950 to 1,250 linear feet per day or 1 mile a week.

PLENTY OF WATER FOR MIXING AND CURING

A Novo pump was spotted conveniently along the right of way at creeks to furnish water through a 2½-inch pipe for the paver and for the curing. There were 5½ miles of pipe on the job with taps for the 400 feet of paver hose every 200 feet. A total of 2,000 feet of ¾-inch hose for curing was kept on the job for the use of the subcontractor as well as the two men of the Lassiter organization who spread the burlap the first day and sprinkled it. As soon as the burlap was removed, the subcontractor put on the earth cover and sprinkled for 7 additional days. The cover was kept on for 21 days and then the contractor sent back a blade grader or scraper and moved the earth to the shoulders.

PERSONNEL

The work for R. G. Lassiter & Co., Raleigh, N. C., was in charge of R. E. Fuller, Superintendent. R. V. Royall was Resident Engineer for the State Highway Department.

Contractors' Pump Standards

STANDARDS for contractors' pumps have recently been adopted by the Contractors Pump Manufacturers Bureau for two sizes of road pumps and three sizes of diaphragm pumps. The Standards, which are confined to pumps especially designed for use by contractors in construction work, have been approved by the Associated General Contractors of America which has authorized the placing of a standard rating plate bearing its seal upon each unit manufactured in accordance with the Standards.

The general requirements of these Standards are as follows:

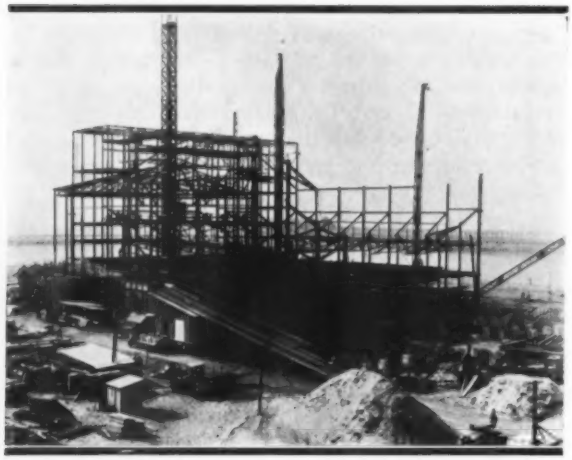
1. Pumps of the types covered by these Standards shall be designed and manufactured to operate continuously at their rated capacities with ordinary care under reasonable conditions.
2. Instruction for pumps covered by these Standards shall be given on a brass plate fastened permanently to each unit or cast integrally on the machine.
3. All moving parts of danger shall be safely guarded in accordance with the requirements of the several states and recommendations of the Technical Committee of the Contractors Pump Manufacturers Bureau.
4. Standards of measurement shall be United States Standards.
5. A. S. M. E. standard sizes of shafts, keys and keyways shall be used wherever the nature of the design permits.
6. A standard nomenclature shall be adopted and shall be used by all members of the Contractors Pump Manufacturers Bureau. It may be revised at any time but shall not be in effect until approved by a majority of the members in writing.
7. A standard rating plate shall be attached to each standard pump which shall state its size and rating and shall also state that it complies with A. G. C. standards for contractors' pumps.

More specific standards as applying to road pumps and diaphragm pumps are also given. Copies of these standards may be secured from the Contractors Pump Manufacturers Bureau, 630 Munsey Building, Washington, D. C.

Progress Report of the Kill Van Kull Bridge

THE second progress report on the Kill Van Kull Bridge between Bayonne, N. J., and Port Richmond, Staten Island, New York, has been published by the Port of New York Authority. The major part of the construction has now been completed and involved the erection of the largest arch span ever attempted. Approximately 18,000 tons of steel were placed in the arch by unusual methods inasmuch as falsework supports were not allowed to encroach upon the shipping channel near the south shore of the bridge site. The remainder of the work will be speedily concluded and it is anticipated that the bridge will be opened to traffic in the latter part of 1931.

Unique Auger Aided Pile Driving *on* Long Beach, Calif., Auditorium Project



The Concrete Plant Layout. Pouring Was Started at One End before the Erection of Steel Had Been Completed

By
Thomas E. Stimson, Jr.

SPEEDING up the driving of piles into a hard subsurface stratum by the use of an auger boring arrangement in the leads of a pile driver was one of several novel features in the building of a new municipal auditorium and exhibition hall at Long Beach, Calif., by R. E. Campbell, general contractor, of Los Angeles. The building, a steel frame and reinforced concrete structure, is located on an 8-acre fill extending 500 feet into the ocean from the beach line. The fill is 12 feet above mean low water and was built up behind a tongue and groove wooden bulkhead, supported by creosoted piling, and is protected from wave action by an encircling horseshoe pier.

The building rests on some 1,800 40-foot green wood piles, which were driven to place by means of a follower, the pile cut-offs being 10 feet below the surface of the fill. The subcontract for driving the piles was handled by the Pan Pacific Piling & Construction Co., Los Angeles. It was apparent at the start of the job that, due to a hard shell and clay formation approximately 20 feet below the cut-off line, placing of the piles would be unusually slow. Water jetting with a large pipe was resorted to, but even with this method not more than seven or eight piles were driven per day.

Speeding Pile Driving

The method of breaking through the substratum which was finally adopted is comparable to the method of drilling used in the oil fields. A pipe similar to a jetting pipe and having a keyed surface was hung in the leads of the pile driver, its lower end being passed through a rotary table on the base of the driver. This rotary table, made up especially for the job, was similar to the rotary table used in an oil well drilling rig. The key on the pipe served to lock the pipe into the table and still permitted the pipe to slide through the table as drilling progressed. Power to turn the rotary table and thus turn the pipe was supplied from the steam engine of the driver, which was moved up onto the gunwales of the rig.

The lower end of the pipe was capped with a fishtail drilling bit having perforated blades. Water was supplied by means of a universal joint at the top of the pipe and was circulated through the perforated bit at the point of drilling under sufficient pressure to rise to the top of the hole, flushing out a good deal of the drilled-out material.

Using this rig, holes were drilled to within 5 feet of the bottom of the piles, the piles then being put in place and pounded down the last few feet to insure sufficient refusal for a steady anchorage. A Vulcan hammer was used for this work. By this method the subcontractors were able to drive upwards of 25 piles per day. The cost of driving was reduced by 50 per cent, after allowing for the cost of the special equipment and exceptionally good placement was obtained.

Due to sea water seepage into the fill, the contractor excavated for footings after the piles had been driven, reversing the usual method. A Link-Belt crane carrying a 1-yard clamshell excavated down to the tops of the pile clusters and the same crane was used to drop tongue and groove sheet piling cribs, which had been previously made, into the holes to hold back the banks. This method was satisfactory but was abandoned because of a change in plans which necessitated the driving of additional piles between the pile clusters, involving the handling of four times as much dirt.

TRENCHING FOR FOOTINGS

The crane was converted to a dragline and was used to trench out the material, one trench being dug for each of ten rows of footings. Each trench was backfilled with material obtained from the succeeding trench as work proceeded. The trenches were dewatered by the usual method, with Domestic pumps. A 3-inch concrete seal was placed on the top of each pile cluster previous to the actual pouring of the footings to assist in keeping out water.

ARC-WELDED STEEL STRUCTURE

The steel frame of the building is of unusually intricate design, due to the interior plan. A number of heavy girders and trusses are involved, including one 70-ton truss which has a span of 140 feet. To make the building as earthquake-resistant as possible, all members of the frame were riveted together, and then arc-welded with Westinghouse equipment.

CONCRETE PLACING SYSTEM

A unique system of placing concrete was worked out, any usual method being impractical because of the dimensions of the building, 200 by 400 feet, and the fact that the design of the steel frame would have interfered with customary methods. The system employed consisted of using a single plant and concreting tower, utilizing a limited amount of chuting, and transporting the concrete by buggy from the tower to the upper end of the chute and also from the lower end of the chute to the point of placement. In some parts of the building it was possible to make the placement by chute, after the concrete had been brought part way by buggy. This method was opposite from the usual practice of chuting away from the concrete tower and using buggies during the last part of the journey.

A four-bag Bremer 21-S mixer was set up on the ground level on one side of the building. Wooden storage bins were built up on top of the mixer, materials being dumped into the bins from trucks which backed up a wooden ramp. A Bremer electric hoist was used on the wooden concreting tower. The concrete was raised to the third floor level to pour all lower forms. Standard practice was to wheel the concrete away from the tower to the temporary location of the chute, which carried the material to a floor hopper adjacent to the area which was then being poured. As much as 270 cubic yards of concrete were placed in one eight-hour shift which, considering the nature of the work, was regarded as very good speed. One worthwhile feature of this method was that the men in the different pouring operations gave little interference to each other.

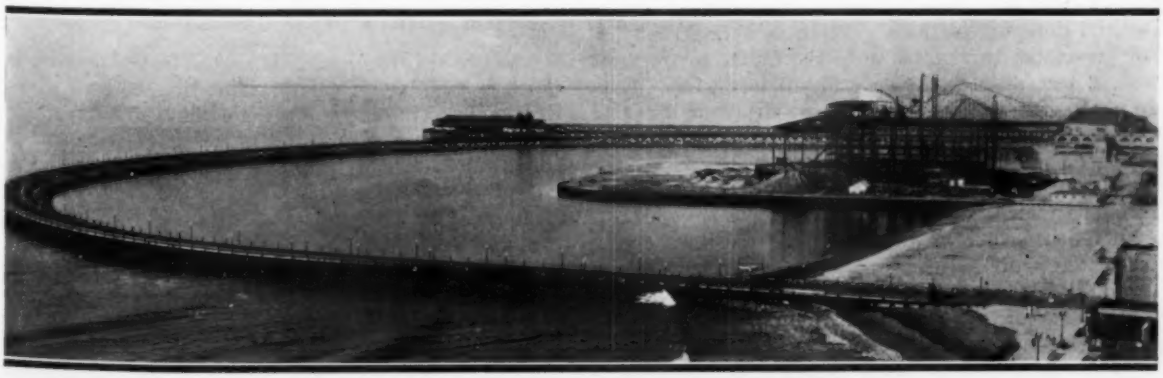
PERSONNEL

Work was started on the foundations in March, 1930, and under the present schedule the building will be completed in December, 1931. Amounts involved, including the cost of making the fill which was done under separate contract, total approximately $3,000,000. J. H. MacDowell of New York City is the architect for the structure, and R. S. Hardy is Superintendent on the job for R. E. Campbell.

Ideas and Overhead

ONE picks up various yarns in the field in which the ideas of superintendents and others are reflected in a very interesting degree. One General Superintendent for a company operating a half-dozen paving outfits was not satisfied with the type of pump that was being used on his jobs so he wrote to the Construction Engineer of the state in which they were doing most of their work and asked for suggestions. The Construction Engineer replied that he would be on the lookout for a new type or adaptation of an old type of pump to this work which was the application of an asphaltic emulsion to the new concrete for curing. About two weeks later he wrote to the General Superintendent again and said that a report had come in from one of the Resident Engineers that a new pump had appeared on his job that was doing the work very satisfactorily indeed, the interesting fact being that it was on one of the General Superintendent's own jobs.

The same General Superintendent told one that was not on himself. The state required that a center line be painted in black down the middle of the slab covering the center plane of weakness. Previously the state maintenance forces had been doing this work with white paint but the new specifications required that the contractor do the work with black paint. One outfit set to work and did it with hand labor, another still with hand labor but between two boards used as stencils. The G. S. thought these too expensive so requested the Superintendents to think out some cheaper method. On visiting a job soon after he noticed a rather wobbly line down the center, or approximate center, of the slab and inquired the method used to secure these rather doubtful results. The Superintendent reported that he had rigged a device not unlike the felt wheel appliances used in city work but for speed he had put it in a trailer pulled by a truck. It was obviously that the trailer had swung behind the truck. The G. S. asked the Superintendent what the cost of application with this method was and received the reply, "Oh, nothing at all, the chief mechanic and myself built the machine and we use it ourselves." No overhead at all!



A General View of the Auditorium on a Fill Protected by the Horseshoe Pier

How Not to Build *a* Cement Dock *and* Trap

Based on Observations of Some Two Dozen Plants This Describes One Which Embodied All the Bad Features

DURING the next year there will be a great increase in the number of contractors all over the United States who will be looking to bulk cement and considering the purchase of a bulk cement plant or constructing a temporary dock and traps for the immediate job at hand. In the series of articles starting in the early fall there are descriptions of a large number of successful docks and plants which will offer many suggestions for those who intend to build their own. This article will describe one dock which was inspected and which had all the poor features and mistakes that a contractor can make. The article is offered as a "horrible example" so that our readers may avoid some of the pitfalls.

We owe the nameless contractor one apology, for he did build his dock ostensibly for two cars of cement and that should be considered by all who are building their own docks. Don't try to get away with a one-car dock for the delays attendant upon opening another car when the first is empty, and moving the second car into place makes the extension of the dock an absolute necessity. But instead of making the runway to the door of the second cement car wide enough so that the men with the buggies could pass he made it about 4 feet wide so that the man in the car had to wait for the first man to get back from the all-too-small weighing and dumping platform. Make your dock and the runs from the two cars toward the center platform at least 8 feet wide or, better still, 10 feet wide. Then two men can pass and there is no delay in handling the cement from the second car.

Don't try to economize with cheap or old and second-hand platform scales for the weighing of the cement carts and their loads. If you do, you will have trouble with the inspector all the time. The scales are subjected to about the most damaging conditions one can imagine. The cement will work its way into the innermost parts of the scales and effect their accuracy. Start right and you will have the minimum of trouble. The contractor whose dock is being described in a general way had a second-hand set of scales and was weighing out more than the required amount of cement at each batch. They had taken the scales apart and cleaned them, the inspector had helped and thus shown his interest in the job and its proper operation. They cleaned every part and tried to adjust them and then sent for a scale man. Finally it was necessary to tear down the dock and build it over to accommodate new platform scales as the old ones could not be put into condition for the work without too much expense.

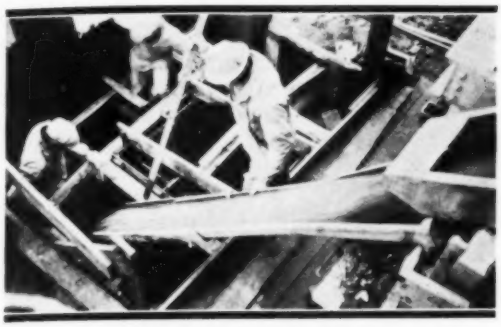
The scales should be so located that the men coming from the two cement cars will not interfere when approaching the scale platform. In the case in mind the men coming down the narrow runway could run onto the scales but when they did they completely shut off the car immediately in front of the dumping platform so that they had to remain in the car until the cart from the other car was weighed. If you have spent as much as two minutes inside a cement car on a hot day you will know that anything that prevents a man getting out for a breath of air is likely to make you a candidate for "the meanest man." Leave a clearance between the scales and the nearest car so that a buggy can be wheeled out of the car while another is being weighed. And also leave enough room between the scales and the dumping trap so that a cart can be stored there.

Now for the trap itself. It should be self-cleaning as much as possible and at the same time be built to deliver the cement onto the batch without scattering. No amount of accuracy in the weighing of the batch is worth anything if five or more pounds are permitted to scatter out the end or side of the truck when the cement cart is dumped at the trap. This "horrible example" had a fair dumping accuracy as regards scattering but the inside of the dumping trap was of rough wood and caught as much as three or four pounds of cement at a time. The inspector stated that when it seemed to be getting too much cement the dumper hit is with his foot and the cement dropped out.

(Continued on page 56)

Railroad Plant Produces Concrete When *and* Where Needed

A Complete Concreting Plant Roams the Rails of the Pennsylvania Railroad Between New Brunswick, N. J., and New York



Pouring an Anchorage

THE electrification of the Pennsylvania Railroad on the New York and Philadelphia Terminal Divisions has many unique construction problems due to the type and location of the overhead catenary structures and the necessity of installing these structures in an efficient manner and without undue interference with train operation.

It has been the practice on such work to distribute concrete materials for the catenary pole foundations and anchors at the site of each foundation and group of anchors along each side of the right-of-way at intervals of about 260 feet and to mix and place the concrete by hand. Being convinced that it should be found more economical and efficient to carry the materials to the site of each foundation on a train upon which the concrete would be mixed by machine and deposited directly by a chute from the mixer into each foundation, the Railroad Company's engineers requested their constructors on the New York Division work to collaborate with them in the development of a special concreting train which would carry sufficient materials for the normal day's work, the aggregates to be fed to the mixer mechanically. Such a train was designed and after approval by the Railroad Company's engineers was built jointly by the constructors and equipment specialists who aided in the design and furnished and installed the apparatus.

The train, photographs of which accompany this article, was placed in service by the constructors on December 15, 1929, and it proved so successful that an additional train of similar design was placed in service on February 7, 1930.

The special features of each of these trains are a mixer car and three bin cars. The cars used are P.R.R. standard flat cars of the Fm class 40 feet 2 inches long. The bin cars have been specially fitted with 70-ton capacity trucks.

Bin Cars

The bin cars are equipped with hopper-bottom storage bins of heavy timber construction with steel plate joints, the interior of the hopper being lined with sheet metal. The bottom of the bin hoppers is set high enough above the car floor to permit free passage of a continuous belt conveyor installed on the longitudinal axis of the car beneath the discharge gates.

The bin space is divided into two compartments, the larger one for gravel or broken stone and the smaller at the forward end for sand. The bottom of the sand bin is raised above the bottom of the larger bin to facilitate canting the belt conveyor so it will spill into the feeding hopper at the tail of the belt on the car in front.

The bins are equipped with cast steel clamshell-type duplex gates for 10 x 12-inch openings, operated by offset hand levers on each side of the cars so that the bin man may always work on the side away from traffic. There are nine gates on each car, six for the stone or gravel bin and three for the sand bin. These gates feed into a continuous belt conveyor 16 inches wide, approximately 41 feet center to center of the end pulleys, equipped with a feed hopper, troughing carrier, side skirtboards, a special tripper device to accommodate the belt as it runs from horizontal to incline, return belt rolls mounted on a wood frame work and a drive end

frame of structural steel. The power for each bin car conveyor is a 5-horsepower air-cooled gasoline engine with friction clutch. Drive and speed reduction are arranged through a steel roller chain and sprockets, the drives and countershafts being carried in babbitted self-aligning bearings with large size grease cups for lubrication throughout.

Each bin car has a storage capacity of about 40 cubic yards of aggregate. For winter work the bin cars are covered with tarpaulin and fitted with wood door enclosures along each side of the conveyor belt. A steam pipe run in this enclosure keeps the belt dry. The aggregates are heated in the stockpiles at the loading depots before loading into the bin cars. Fire extinguishers are mounted at readily accessible points on each car.

The design of these cars required much study to produce full carrying capacity within the prescribed limits governing safe operation of such equipment on the railroad right-of-way. In operation, the bin car nearest to the mixer car is usually emptied first, then the one immediately in the rear, and finally the third, if necessary, but the arrangement is such that these cars may be emptied in any selected order.

MIXER CARS

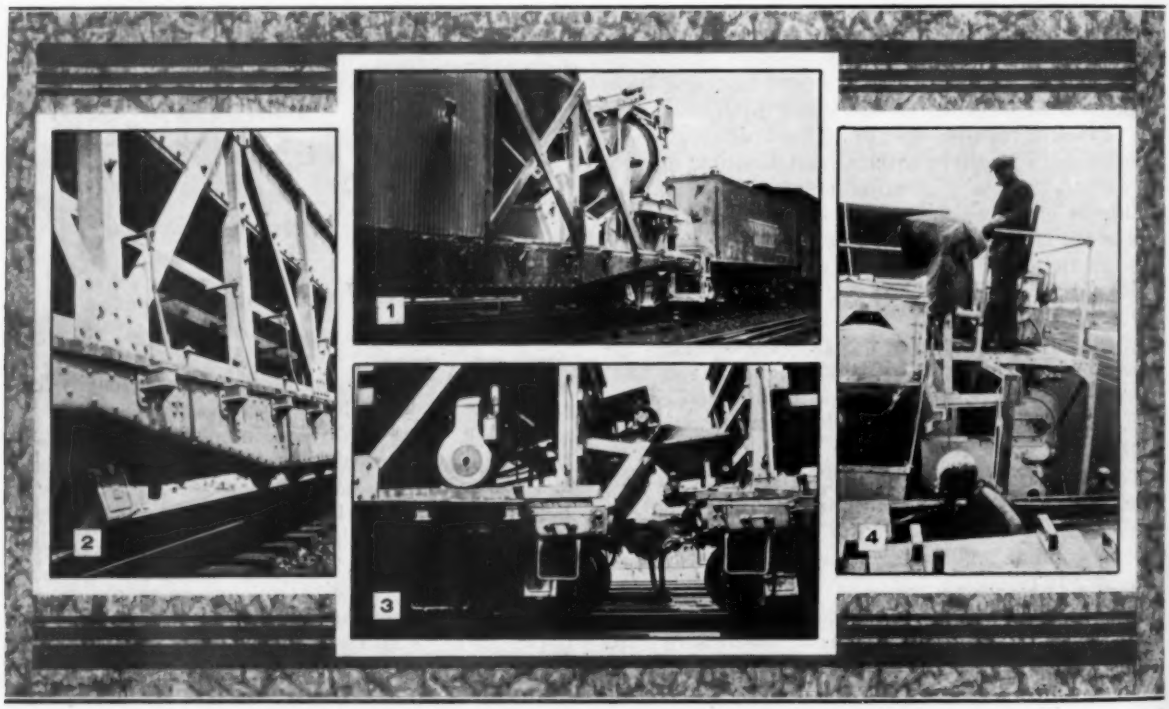
Each mixer car is equipped with a ¾-yard mixer placed at the forward end, the drum being set transversely on the car so that the mixer will discharge on the longitudinal axis of the car into a 2-way steel hopper with steel legs and arranged to discharge concrete from the mixer to the edge of the car whence it flows to the forms through standard steel chuting.

The mixer is direct-connected to a 32-horsepower water-cooled gasoline motor and is fitted with an automatic water tank charged by a small centrifugal pump direct-connected to the mixer power. It is served by a two-compartment elevating power loader. A steel two-compartment batch hopper with a capacity of about four batches supported on a structural steel frame discharges into the mixer loader through specially arranged hand-operated bottom-dump gates.

The batch hopper is fed by an inclined belt conveyor, 16 inches wide, of special design, fitted with bronze cleats, skirtboards, troughing carriers, return belt rolls, special gravity belt take-up, and special belt feed hopper. Power and drive for the mixer car conveyor is similar to that described above for the bin conveyor.

A cement shed the full width of the car and about 18 feet long of timber box car construction sheeted with corrugated iron has been built on each mixer car from the rear of the batch hopper to the rear end of the car, enclosing the inclined conveyor and affording storage for about 250 bags of cement. An additional carload of cement usually is attached to the concreting train. The cement is dumped from bags into the loading skip by hand.

(Continued on page 74)



VIEWS OF ONE OF THE PENNSYLVANIA RAILROAD CONCRETING TRAINS

1. The mixer car, showing at the left, the cement house, then the charging hopper, the skip and mixer. The tender seen to the right, carries water for the mixer and the freight car at the extreme right is one of the two carrying cement in bags. 2. A close-up of one of the aggregate cars showing the gate handles which are duplicated on the other side of the car for discharging either stone or sand as required onto the belt conveyor, carrying it to the mixer car. 3. Method of handling aggregates between cars. The gasoline engine for operating the belt is shown at the left and the elevated belt of the left-hand car is shown prepared to discharge aggregates into the receiving hopper of the right-hand car. 4. A view of the mixer car from the water tender, showing a floodlight covered with tarpaulin. This floodlight is used to illuminate the concrete chute for night work.

Rain—Heat—Muck Holes

Made Start *of* 10.3-Mile Paving Contract a Problem

The Butler Bulk Cement Plant. Dumping Cement to Receiving Hopper and Loading a Batch

Streu Construction Company Had Slow Going in First Three Weeks But Soon Hit Stride of 1,180 Feet of Slab Per Day

IT would be enough to take the heart out of any but old-timers to have the first two weeks of a paving contract present almost continuous rain followed by a record-breaking heat wave. Then the grade for the first 2 miles skirted a lake which was surrounded with soft, spongy ground. Yes, it would have just about licked a new outfit, but the Streu Construction Co. is an old organization and they waded in, said anything but prayers and pulled through with colors flying. Imagine this combination—a soft grade on which you are working slowing up production, then just ahead a piece of particularly soft muck over which the trucks must haul to reach the paver; Friday, the day before a holiday, and such a spell of fine weather behind you that it would seem almost too good to be true that it could hold out over Sunday, so that you could get across the soft spot before a rain. And how it did rain on Sunday! Well, that is contractor's luck and a part of the game. You can build up a fine organization but you cannot control the weather.

There were six bad muck holes on this job that had to be shot to settle them sufficiently for the work to go on unimpeded. The shots were spaced 8 feet apart, using 2-inch pipe driven through the fill by hand. A surcharge of 5 to 7 feet was carried before shooting. The pipes were driven in at an angle from the side, a pocket made by firing two sticks of dynamite and then the hole loaded with about twenty-five sticks of du Pont 60 per cent dynamite, and shot. The work was directed by a man from the technical staff of the du Pont organization.

Shovel and Elevating Grader Tackled the Rough Grade

Work on the rough grade was started on May 5, 1931, and fine grading began on June 5 with the concreting gang following two days later. The contract called for the completion of the job in 100 working days. The new Wisconsin labor law forbids work on paving on Sundays and holidays. In previous years holidays were not counted as working days, but there was nothing to prevent the contractor from doing work on such days

A Littleford Trailer Asphalt Kettle Ready to Set Up to Pour the Joints

to catch up if rain and other trials had caused any delays.

The rough grading involved the handling of about 170,000 cubic yards of dirt. This was moved with a Bucyrus-Erie 1¼-yard shovel and a Caterpillar elevating grader. Hauling from the shovel and the grader were twelve Caterpillar Sixties and twelve Euclid 7-yard crawler wagons. Two Caterpillar Thirties with bulldozers spread the dirt on all the fills. The cuts were not deep, averaging about 15 feet.

Setting Forms and Preparing the Fine Grade

Two form setters on each side placed the 9-inch Metaforms in a trench cut by an Adams 12-foot blade grader pulled by a Caterpillar Thirty. Another Thirty with a Wausau scarifier loosened the grade where high and moved the dirt with a Euclid rotary scraper. Following the setting of the forms one of the Thirties pulled the Lakewood subgrader along the forms and cut the grade to true cross section. A crew of ten shovel men trimmed the grade by hand between the subgrader and the paver, covering up the tracks of the trucks in soft spots and maintaining the section cut by the subgrader. One man realigned the forms and cleaned them, while a second man tamped under the base of the forms and oiled them. A Wehr-Fordson roller compacted the grade ahead of the paver.

Gravel Pit Equipped for Speedy Production

A well-planned layout in the gravel pit made a compact plant possible with one crane to handle the three aggregates. As proof that the best laid plans may come to naught, the production was held up in the early stages by lack of water. The contractor installed a 4 x 5-inch Allis-Chalmers pump at a nearby lake and ran it with a 65-horsepower Waukesha motor. The discharge line carrying the water to the washer at the pit was 6 inches in diameter. Local residents had informed him that the level of the lake had never fallen, so a reasonably easily installed shallow intake was used. After about three weeks of operation the lake showed a material drop in level which necessitated carrying the intake farther out into deeper water. This meant shutting the plant down for a day, but heaping stockpiles carried the paver over without any difficulty.

Material from the pit was pulled in to the hopper and grizzly with a Garst drag scraper by a Mead-Morrison hoist powered with an 85-horsepower Hercules motor. Most of the stone went through the light rail grizzly without any attention. A continuous belt feed led the pit-run gravel to a belt conveyor which carried it up to a 42-inch Toepfer scalping screen. Oversize material dropped through the end into a chute leading to an Allis-Chalmers 8-inch Superior McCully crusher run by a 75-horsepower Waukesha motor. The crushed stone discharged to a belt conveyor leading to a hopper over the primary feed belt. The rate of feed from the hopper was controlled by a gate. This belt carrying crushed material was run by a Novo 8-horsepower engine.

All fines from the scalping screen discharged onto a belt conveyor leading to the second screen of the same make but of the circular type with washer. This screen was operated by a Waukesha 65-foot motor through a Twin-Disc clutch and Jones gear speed reducers. Washed sand was taken from the washing hopper by twin screws and delivered by a belt conveyor run by an 8-horsepower Novo engine to the sand stockpile. Two other belts each run by a Novo 8-horsepower engine carried the two sizes of stone to conveniently located stockpiles, from which a Koehring crane with 40-foot boom and 1-yard Owen bucket could load direct to the two batching plants.

The labor organization in the pit consisted of one drag scraper man, three men on the plant and the crane man. The plant was equipped for night operation with electric lights at all important spots. Power was furnished by a Kohler 1,500-watt electric plant. It was seldom necessary to use the lighting system, as use of the daylight hours from 4 A. M. to 9 P. M. furnished sufficient aggregates for the paver with ample stockpiles ahead.

Weighing the Batches—Aggregates and Bulk Cement

Two Butler batching plants, the first for the two sizes of stone and the second for sand, were located close to the stockpiles with one man on each plant to weigh out the batches. The trucks drove into the ample sized yard, and backed under the stone batcher and then out and backed under the sand batcher, pulling out to the Butler bulk cement batching plant near the entrance to the yard. The weights of the batches were: 1,400 pounds of coarse stone, 1,100 pounds of pea gravel, and 1,428 pounds of sand for 689 pounds of cement to make a standard 33-cubic foot batch. A fleet of 3-batch Sterling and International trucks, amounting to a maximum of twelve trucks, handled all the hauling of batches by subcontract.

Bulk cement was delivered in box cars at Foss Siding, 3 miles from the batching plants. Two trucks with steel bodies and equipped with canvas to cover the cement during hauling made the run continuously between the siding and the plant. The bulk cement was unloaded from the cars by four men using wheeled scrapers and running them out over the hauling trunks to dump. There was little loss from cement blowing about during the loading from the cars. At the Butler bulk cement handling plant which was located on the side of a hill the cement hauling trucks ran to the back of the plant and dumped directly into the receiving hopper, from which the cement was carried laterally by a set of screws to the bucket elevator. This part of the plant

was operated intermittently as required by a LeRoi gas engine. Two men ran the complete bulk cement plant, one weighing and the other covering. When a load of cement was delivered to the receiving hopper the man who covered the cement on the batch with sand would watch to see that the cement was not bulking in the hopper and at intervals would pole it down.

WHERE THE PAVEMENT BEGINS

The gravel pits from which the aggregates were secured for this job was located about 3½ miles from the north end of the job. Paving was started at a point 3 miles from the south end and continued until the pit was reached. Then the 3½ miles from the north end to the pit was poured, and finally when the first stretch was open to traffic the last 3 miles from the south end was poured running north.

Excluding the first three weeks of most unusual conditions of weather and subgrade, the organization averaged 1,180 feet of concrete 20 feet wide and 9-6½-9-inch section per 10½-hour working day. One active man dumped the batches into the skip of the Koehring 27-E paver, and saw to it that not one bit of the batch stayed in the truck. A most active man around the paver was the son of one of the partners, who as concrete foreman was into everything, pulling the hose ahead one minute, tossing in some dowels the next and seeing to it that the concrete crew had an example of energy and team work.

The paver pulled a Koehring trail grader from which two men shoveled the excess dirt. Three puddlers handled the shoveling, spading along the forms and shoveling to the strike-off of the Lakewood screed. Immediately following the screed was the Heltzel Cleft-Plane machine, with two men setting the wedges for the continuous longitudinal plane of weakness, and the transverse planes at intervals of 30 feet. The steel crew of two men set the 1-inch premoulded Elastite expansion joint with a special joint setter every 90 feet. These same men set the 4-foot by ½-inch deformed bar dowels on 2-foot centers along the center plane of weakness, and set ten across each transverse plane and through the premoulded expansion joint. Each dowel had a metal sleeve on one end on the transverse joints and expansion joints. The Lakewood machine carried two screeds and the Cleft-Plane machine a belt at the back. American 6-inch mesh steel fabric was set 2½ inches from the top of the slab along all sections where the grade was in the least unstable and at all bridge and culvert approaches.

FROM GRADE TO COMPLETED ROAD

1. A Caterpillar Thirty and Euclid rotary scraper working between the forms. 2. The C H & E triplex pump furnished water from a lake close by the grade. 3. Two Butler bins and weighing batchers with a Koehring crane and 1-yard bucket loading them. 4. Swinging around a long curve at the end of a lake and approaching a muck hole section.

Lunch at the Edge of the Swamp—Note the Community Lunch Box.

Behind the Cleft-Plane machine were two men with the 12-foot longitudinal float working from twin rolling bridges connected at the forms. These men also handled the one canvas belt after the "bull float." Two hand finishers on a rolling bridge pulled the wedges from the planes of weakness and edged the pavement. There were two men spreading the burlap, which had been spotted along the shoulder ahead, and these same men sprinkled the burlap for the remainder of the day. On the following day a crew of six men removed the burlap, rolled it up and sent it forward by the two men who pulled forms and hauled them forward with a team and wagon. These men covered the pavement with earth, and then from three to eight men, depending on the amount of slab to be cared for, sprinkled the cover.

When the burlap was removed, and immediately ahead of the cover, two men with a Littleford 84 WS tar kettle and hand pouring pots poured the continuous longitudinal slot and the transverse slots forming the planes of weakness to control the formation of cracks in the slab.

WATER SUPPLY FOR THE PAVER

Water for the paver for the sprinkling of the burlap and the earth cover was supplied by two C H & E triplex pumps, one located ahead and one behind the paver. Both 2½ and 2-inch pipe was used, with the taps for the paver hose and sprinkling inserted at intervals of 350 feet. The paver carried 200 feet of 2-inch hose.

NOON MEAL BROUGHT OUT TO THE GRADE

There is considerable difference of opinion among contractors operating camps as to whether it pays to haul the men in to camp for the noon meal or whether it is better to take the food out to the grade. The Streu organization believes that the men deserve the rest that they can secure by dropping down where they are rather than riding over the rough grade in dump trucks to eat a hasty meal and then ride back to work immediately.

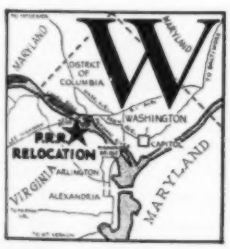
Mess is brought out to the men in a large wooden box measuring about 3 feet square at the end and 6 feet long, and painted a light gray to give it an appearance of neatness that should go with the preparation of food and the serving of it whether it be for an invalid or for a husky paving crew. The box has four heavy handles, two at each end, similar to those used on tool boxes, so that four men can easily take it from the Ford delivery truck and place it in a convenient shady spot at the center of activity. The cover of the box is hinged, and when thrown back has two legs to support it to form a table on which the containers of food and the various cartons of knives, forks, spoons and enamelware cups are set up. One man accompanies the box to serve the coffee, milk and pie. Large enamelware plates are stacked at one end, and the men file by and help themselves to plate and utensils, and then take whatever they want from the line of aluminum kettles of meat, vegetables and gravy. In the large wooden box there is a big can into which the men cast their cups and knives, etc., and the plates are stacked in one corner. There is no great rush, as the various crews cannot quit work at the same time. The grading crew arrives first, then the truck drivers, then the concrete crew, and last of all the finishers. One important container that must not be forgotten is the large wooden rack of pies, which melts rapidly as the hungry group swarm down on them. Each man receives one-fifth of a pie for a serving.

PERSONNEL

The Streu Construction Co., Two Rivers, Wis., is completing this 10.3-mile project within the contract limit in spite of the initial troubles which make up the title of this article. The company is composed of E. J. Streu and D. H. Ames as partners, both of whom are active in the handling of the work in the field. For the Wisconsin Highway Commission, William Kilduff is Resident Engineer.

Marye & Blankenship
of
Shawsville, Va.
Moved the Grade
of
a Branch Line
to Run Trains
Through a Tunnel
at the
Virginia End
of the
Arlington Memorial Bridge
at
Washington, D. C.

Masking a Belt Line Railroad



WHEN mere railroads interfere with the beauty of a new structure that is being built to perpetuate the memory of the famous warriors of the past in our Nation's capitol, plans are made at once to move the railroad. Such was the case at the Virginia end of the Arlington Memorial Bridge which has been under construction for about five years across the Potomac River, extending from the Lincoln Memorial on the Washington side to the grounds of Arlington National Cemetery on the Virginia side. The Virginia end of the bridge opens onto a plaza which will eventually be the northern end of the Mt. Vernon Memorial Highway. From this plaza a short span bridge crosses the Boundary Channel and the highway then crosses the Rosslyn Branch of the Pennsylvania Railroad which has been depressed and run through a tunnel. The tunnel cut, an open cut job later backfilled, was completed and was not a part of the Marye & Blankenship contract which did, however, extend on either side of the open cut tunnel section.

Grading Progressed Rapidly

This grading job started at Station 231 + 60 and proceeded on a 1 per cent down grade as far as the tunnel section and then up grade at the same slope. The total length of the contract, exclusive of the tunnel section, was 4,029 feet. Marye & Blankenship started the job on May 11 after having completed a small grading job in Arlington Cemetery and some work on the U. S. Department of Agriculture Experimental Farm in Arlington, and completed the work in 90 calendar days.

The new grade is entirely through new country with trees having trunks from 15 to 36 inches in diameter. These trees were cut and the stumps dug out by the Bucyrus-Erie 7/8-yard steam shovel in cut and in fill they were left in if the cover was over 5 feet. As the shovel encountered no stone and worked mostly in sand and clay with a small amount of gravel the work was pushed ahead rapidly. The shovel was worked two shifts daily, the first from 4 A. M. to noon and the second from noon to 8 P. M. The shovel and the fleet of six hired trucks, including an Indiana, a Republic and several Chevrolets, moved an average of 1,200 yards in 16 hours. Because of several soft spots in the grade which held up the heavier trucks, and the faster return

Excavating a Double Track Section

speed of the lighter trucks, the Chevrolets worked out very well on this contract, hauling a high percentage of the day's excavation.

The average haul of the trucks was about 600 feet on the job proper, but as there was a large amount of material wasted it was necessary for the trucks to haul as far as 2,000 feet to dispose of the spoil on Columbia Island at the site of the plaza connecting the Mt. Vernon Memorial Highway and the Arlington Memorial Bridge. To prevent damage to the concrete floor of the Boundary Channel Bridge, across which the trucks had to haul, the contractor was required to plank the bridge both ways. This bridge is later to be surfaced with sheet asphalt. The Boundary Channel Bridge itself is 300 feet long.

Sections in Cut and Fill

The new grade which was prepared under this contract was for a single track part of the distance and double track the remainder. The total excavation was 52,283 cubic yards and the fill 8,708 cubic yards leaving 43,575 cubic yards to be wasted as described above.

The sections in cut for single and double tracks were 30 feet wide for the single and 44 feet wide for double tracks, allowing 4-foot ditches on either side and 14 feet center to center of the tracks for the double track section. All the slopes on both cut and fill are 1½ to 1. On fill, the top of the fill was 36 feet wide for the double track and 22 feet wide for the single track section.

The Bucyrus-Erie Shovel Working Behind a Section of Bank of the Old Alexandria-Rosslyn Canal

An interesting relic of early construction was met in the grading on this job. The line of the old Alexandria-Rosslyn canal was crossed at one point and the uniform section bank on the river side was very well preserved. Within the memory of living men this canal was used and in winter was the scene of many skating parties, but the canal was abandoned many years ago as a commercial activity owing to the competition of the railroad. There has been no water in the canal for a number of years.

Drainage Structures

To carry the drainage from the steep adjacent slopes under the fills the contractor was required to install two 24-inch cast iron culverts 48 feet long, three 24-inch cast iron culverts 60 feet long, and three 30-inch cast iron culverts in one group 48 feet long. All the culverts were standard cast iron pipe.

The maximum depth of cut was 35 feet and the average depth 15 feet. The fills averaged 18 feet in depth with the maximum 28 feet deep.

Personnel

The work on this contract was done under the direction of the Arlington Memorial Bridge Commission, Col. U. S. Grant, 3d, Executive Officer, with J. C. Spot as Resident Engineer. The work of the contractors was under the personal supervision of C. E. Blankenship, Marye & Blankenship, Shawsville, Va.

How Not to Build a Cement Dock and Trap

(*Continued from page* 48)

Thus one batch in every five or six was rich in cement and the remainder were deprived of the proper amount. Each trap should be lined with galvanized iron so as to deliver the entire batch on each dumping.

In cases where the trap is dropped down to the truck as was this one, it must be counterbalanced in some way. This trap had two wood boxes weighted with scrap iron, we have seen the complete parts of at least ten old Model T Fords in these boxes in our travels, and the boxes ran in wooden guides which were greased frequently to permit the boxes to slide easily. There were ropes run through pulleys overhead and no attention paid to oiling the pulleys. The ropes had worn out several times in the course of a few weeks operation. Traps of this type are good but the pulleys should be oiled frequently and the boxes run under the platform in guides as loose as possible. By far the best type of dumping trap is the one with the side beams running back under the platform, doing away with the need for overhead pulleys and ropes and using the platform itself for the support of the cantilevered trap. It can be counterbalanced with scrap iron or a wood box but neither have to be run in guides and are free to move without attention. Where ropes are used they have to be shortened as they stretch, and adjusted after every rain.

Put some real brains into your cement docks and the results will pay big dividends!

Insurance *for the* Contractor

By
Clarence T. Hubbard

DESPITE the fact that automatic-reporting builders' risk fire insurance forms are now several years old, this automatic method of insuring construction jobs has not been generally adopted, although it is growing in favor.

Of course, one reason has been that some of the fire insurance rating bureaus did not approve this method of insurance until recently. In fact, New York City only adopted the form during the last months of 1930.

The difference between a straight builders' risk fire insurance policy and the automatic-reporting cover is that under the ordinary fire insurance policy you have to increase the amounts by notifying your agent at certain intervals at which time he issues an endorsement which is attached to the fire insurance policy, so increasing the amounts. This has not always been satisfactory, because you may fail to increase the insurance sufficiently, or your accountants may overlook notifying the agent, or even the agent and broker might forget to bind the additional amounts desired. On the other hand, you might increase the insurance more than necessary in order to play safe and find yourself over-insured, and therefore, overcharged.

Under the automatic-reporting form a fire insurance policy is issued, but with a "limit of liability" up to which you are automatically protected at all times. Then once a month on a certain agreed-upon date, you submit a statement showing the values of the building, or of your tools and equipment, whatever is being insured, and you are charged for the actual insurance needed, according to such reports.

For Example—

To illustrate, you are constructing a building or a bridge, or whatever your contract may be, and you are required to insure the materials until the building is completed. The total job may cost $200,000. You specify to your insurance agent or broker that you want an automatic-reporting builders' risk policy.

He issues the policy with a limit of liability of $200,000, and you are automatically protected up to that amount at the time. As soon as your work commences the policy is dated and issued and you agree to furnish your agent with a report on a certain day each month, let us say the 10th. Then on the 10th of the first month you submit a report, which we will assume indicates materials valued at $20,000 to begin with. The builders' risk rate for one year is charged against this first report of $20,000. If the rate is 1 per cent, the premium is $200. This is paid as an initial premium. On the 10th of the month following, your values show $50,000 which you report, and so on on the 10th of each month, and yet you are automatically protected at all times up to $200,000. Your monthly report, however, must be accurate and in the event of a loss, an audit is made of your books. If you have failed to report your full values you are penalized in the loss adjustment.

In figuring the premium charge, each month's statement of values is dated back fifteen days by the insurance company in order to arrive at an average. This sounds complicated, but it isn't. As outlined, you submit the first statement on the 10th of the month which shows $20,000 and you are charged, to begin with, for the amount of premium which the rate develops for one year. When the second statement arrives on the 10th of the following month you are charged 11½ months premium for the increased amount over what you first reported. If there was an increase of $30,000 in values you are charged 11½ months premium for that $30,000 and billed accordingly. The third statement brings a 10½ months charge. The fourth, 9½, and so on until the last one is on the basis of 1½. If the job continues longer than one year the policy is cancelled and rewritten and so started all over again, or else the policy is written for a longer term to begin with, but in each case the statement, when received by the insurance company is dated back fifteen days prior to your date, simply in order to get a fair average charge. The additional premiums are figured on a pro rata basis.

The Advantages of Such Insurance

The advantages as stated are that you have full protection at all times and yet are only charged for the actual values reported, and for the term that the increased values are in force, but it is most important that your report of values be accurate for there is a so-called honesty clause in the policy which will penalize you just as a co-insurance clause if, at the time of a loss, it is discovered that you did not report your full values. Following are several of the important insuring clauses:

"This policy also covers on builders' sheds and machinery, tools, implements, utensils, apparatus, materials and supplies of every description, entering into or used in construction of said building, whether in, on or about said building, or on sidewalks, and/or streets and/or adjacent thereto, or on premises adjacent thereto, as well as interests of others, for which the assured may be liable, are covered hereunder. Cost of excavations, brick, stone, or concrete foundations of buildings which are below the under surface of the lowest basement floor, or, where there is no basement, which are below the surface of the ground are excluded from this insurance and the value of such excluded property shall not be used for co-insurance purposes.

"This policy is issued as a special agreement with the assured, who covenants and agrees to keep a set of books showing a complete record of the value of the property above described, and on the day this policy is issued, shall file with the company a statement, showing the value of the property herein described on that date, which shall be the initial amount of insurance under this policy and the basis upon which the initial premium shall be computed.

"It is a further condition of this policy that the assured shall file with the company a statement, showing the value of the property insured, every thirty days after the initial statement is filed, and the increase in the values shown in the last statement over the values shown in the previous statement shall represent the amount of additional insurance hereunder and the basis upon which the additional premium shall be computed on a basis of fifteen days prior to the date of such periodical statement of values.

"It is a condition of this insurance that the assured shall be indemnified for no greater proportion of any loss than the last reported value of the property insured hereunder bears to the actual value of the said property at the time of such last report and in no event for more than the actual loss.

"This policy shall cover the property herein described only while in course of construction and it shall be void and cease to cover when the building or buildings insured hereunder are completed or occupied for any purpose whatsoever, unless otherwise provided by written agreement hereto attached."

This policy can be issued to cover several construction jobs being carried on at once by having the various locations stipulated in the policy with limits of liability for each location but with separate reports demanded for each job. If the jobs cover in different States separate policies are usually issued for each State. This insurance is available against loss by fire, tornado, earthquake, riot and explosion.

One particular advantage to the contractor is that under this reporting form one insurance company will usually take the entire risk for they find it easy to reinsure by percentage with other companies.

Riot and Civil Commotion Insurance

There has been a considerable interest during the past year in riot and civil commotion insurance, formerly known as strike insurance. The proper title for this coverage is riot, civil commotion and explosion. Not every contractor fully understands this policy, and neither does every agent. It is the explosion insurance policy extended to cover riot and civil commotion. In the first place it covers explosion damage resulting from any cause, not just explosion which is the result of a riot. Dynamite explosions, oil burner explosions, gasoline explosions are all covered. If an explosion occurs near by but away from your premises and yet damages your job, such a loss is collectible under the riot policy, although the contract has been bought chiefly by contractors to insure them against loss from dynamiting, especially to steam shovels. Under the riot feature any loss by riot is covered but no one can determine in advance just what constitutes a riot.

What's a Riot?

The insurance companies have an understanding, more or less, that the united effort of three or more persons constitutes a riot. This, however, is difficult to prove in cases of loss, and there have been many suits with various decisions. In one large risk suit of this kind, the courts defined a riot as a tumultuous uprising.

At any rate you should be clear, as a contractor, on the one vital point and that is, unless specially endorsed, the riot policy positively does not cover malicious mischief or sabotage. Another vital point is that the riot insurance policy assumes the fire damage providing your fire insurance policy becomes voided if there is a riot. Remember when you buy an explosion policy without the riot feature that the explosion policy does not cover any fire damage whatever. Your fire insurance policy will pay for fire damage the result of an explosion, but will not pay for any explosion damage, neither will it pay for any fire damage the result of a riot. Both the explosion and riot policies also exclude any explosions of steam boilers, and fly wheels.

The riot insurance policy is non-cancellable by either party for a period of ninety days. The fire insurance companies have regular established rates for riot policies which vary, but are usually in the vicinity of from $1.50 to $2.00 per $1,000 according to the type of construction, whether fireproof or frame. If, however, you attempt to buy a riot policy while a strike is in process or during a time when there is mob violence the rates are usually trebled. This does not mean that your rates would be trebled on a policy in force, but only if you attempted to take out a new contract during such times.

Insurance for Your Equipment

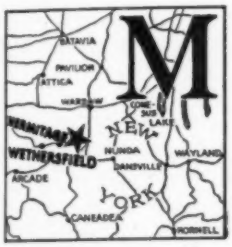
It is also possible today to buy all risk insurance covering your rolling stock and equipment. Such a policy insures your tools and equipment and shovels against loss usually by fire, tornado, vandalism, riot, lightning, earthquake and in transit. You cannot insure the materials on a contracting job in this fashion, but simply your equipment. It is known as the all risk contractors equipment policy.

Fast Paving

with

Minimum Concrete Crew

Cramped Conditions at Batching Plant Failed to Hold Back the Rochester Concrete Construction Company



MANY contractors would have heaved a sigh and felt half licked if they had been forced to put up with the batcher plant location that the Rochester Concrete Construction Co. used on Contract 1873, consisting of 6.92 miles of 8-7-8-inch reinforced concrete pavement 20 feet wide running from Wethersfield through Hermitage to N. Y. State Route 19. A 2½-mile dead haul to start with over a none too good earth road did not stop them from getting in an average of 1,300 feet of half-width pavement each ten-hour day and several runs up to 1,500 and 1,800 feet per day. The trucks had to make a long swing over a narrow bridge with right angle turns at both ends, then run down hill about 500 feet and around a coal shed to the cement cars on a siding that was used also by the local coal company. When an order for coal was being filled from the slow feeding chutes the batch trucks were held up. Then there was a straight run of about 400 feet toward the batcher but on this run the trucks had to turn. Some elected to turn immediately around the coal shed, while others turned on a crossing over the main line tracks of the Buffalo, Rochester & Pittsburgh Railroad. The contractor maintained a flagman at the crossing all the time to protect the trucks, all of which used the crossing in pulling out from the batcher except when the local freight was switching and spotting cars.

Gravel was shipped in by rail by the Buffalo Slag Co. from its Machias, N. Y., plant, the coarse gravel being shipped in hopper-bottom cars which were dumped into a pit at the batcher and the fine gravel and sand from the same source being clammed out to the batcher or stockpile by a Koehring crane with a 45-foot boom and a 1-yard Blaw-Knox clamshell bucket. The same outfit clammed from the pit for the coarse gravel. The plant crew consisted of one man in the aggregate cars, the crane operator, a weigh-man on the batcher, and two men in the cement car. As the job was a 2-course concrete pavement it was necessary to alternate the batches to take care of top and bottom. The run was three bottom batches and then one top. The two men in the cement car with the checker kept the batches running with almost no errors. Any changes in sequence were brought back by the truck drivers. The cement men handled a maximum of 3,384 bags of cement in

Swinging a Batch Box from a Truck to the Paver Skip

Putting a Strip of Elastite Expansion Joint in the Placing Cap

one day, stacking them, cutting and emptying them into the batch boxes on the trucks before the aggregates were put in. At the cement cars there was much talk that sounded like violation of the Volstead act but after listening to it for a few minutes it was learned that a "high ball" was the local name for a batch of the top mix.

The batches were made up for the top with 2,060 pounds of fine gravel and 1,400 pounds of sand with 10 bags of cement. The bottom mix was 2,360 pounds of the large stone, 1,342 pounds of sand and 7 bags of cement.

MAKING THE GRADE

The grade was ready for the concrete from 500 to 900 feet ahead of the paver with the forms set and aligned. The crew on form setting consisted of four men who cut the form trench and set the forms. These were followed by four other men who roughed in the fine grade, checking it with a scratch board ahead of the 5-ton Buffalo-Springfield gas roller. A second fine grade crew of four men then checked up with another scratch board and made the grade ready for the concrete.

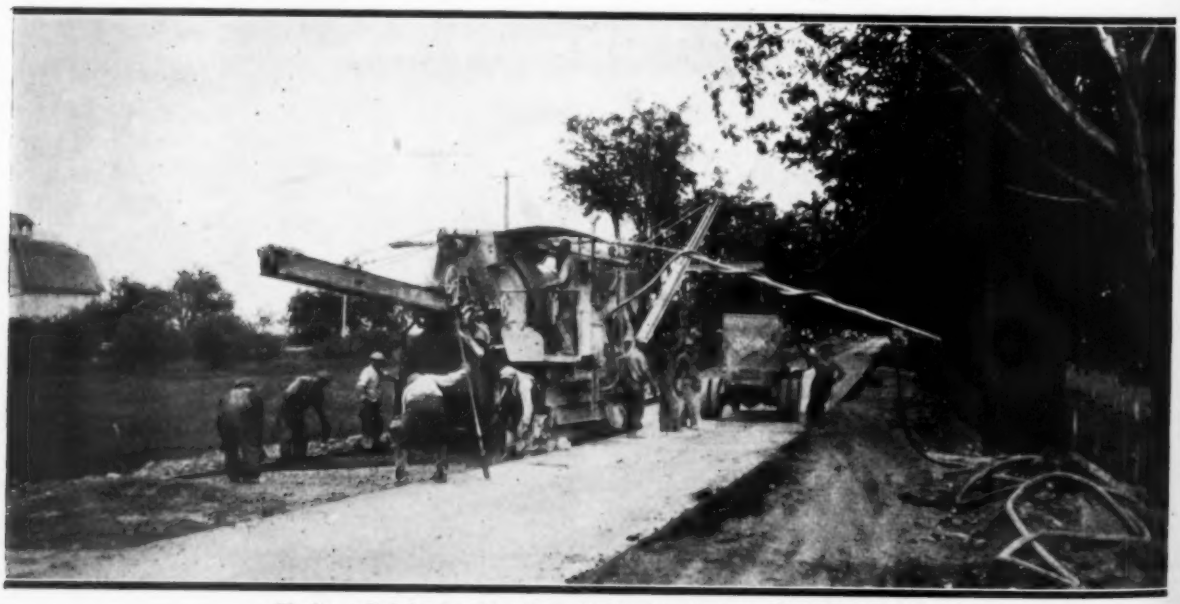
PLACING THE CONCRETE

All hauling of batches was sublet to one man who hired independent trucks locally. There were both 2 and 3-batch trucks but the former predominated. All the trucks were flat bed units with rails of various materials at the sides to hold the Blaw-Knox batch boxes in place. The paver operated in the space between the forms and the trucks ran in the adjacent strip either on the unfinished grade, or, when the first strip had been completed, on the concrete. It was necessary for the trucks to go beyond the paver a considerable distance at times to turn in a drive and then drive past the paver again. In these cases the trucks ran off the road causing considerable trouble with springs and axles. The contractor showed a great deal of interest in the welfare of the hired trucks and tried at all times to have the grade or shoulder finished close to the pavement at frequent intervals to minimize the danger of smashes.

Ahead of the paver one man cut the notches in the grade for the ⅞-inch Elastite expansion joint that was placed every 78.5 feet. This same man also oiled the forms or face of the first strip before pouring. Two men handled the boxes from the trucks, emptying them and returning them to the trucks. One of these men had the chain attached to the outside of the hooks and pulled the box and boom back as soon as the box was empty. There was one man at the hoist of the Koehring 27-E paver who also helped turn the boxes over. The paver operator kept close track of the batches as they arrived at the site of operations and placed them as required either forward or back on the top course. The bottom course was kept about 14 feet ahead of the top, that being the approximate length of the fabric reinforcing.

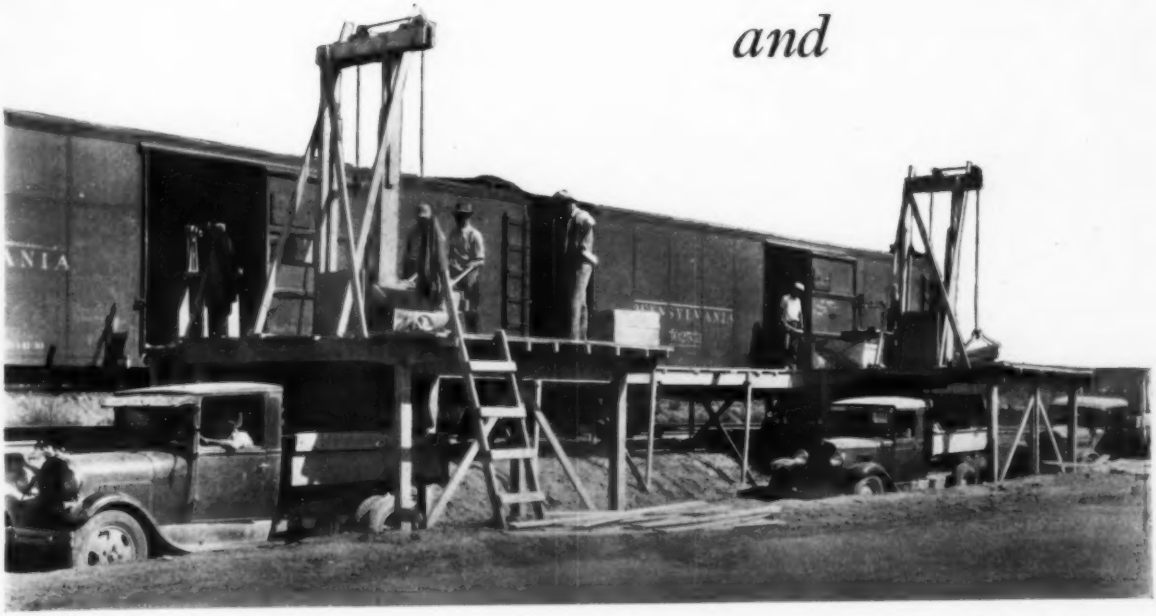
On the wet side of the paver one man was busy spading the mix against the forms, two men shoveled the bottom course concrete and two others shoveled the top against the strike-off of the Ord finishing machine.

(*Continued on page 63*)



Placing a Reinforcing Mat Immediately Ahead of the Koehring Paver

Bulk Cement—



and

How One Paving Contractor Handles It

Two Plants of West Virginia Contractor Show How Methods Can Be Improved Through Attention to Details

A COMPLETE analysis of the benefits of bulk cement to the paving contractor has been made by W. L. Johnson Construction Co., one of the larger paving organizations operating in West Virginia. The first saving is that the cement costs about ten cents a barrel less in bulk than in bags. Next comes the several hundred dollars saved on each job through doing away with lost cement bags. By the system of handling the bulk cement which has been developed by L. M. Deardorf, Superintendent for the Johnson organization, the time of the trucks is cut materially in loading and unloading the cement, and lastly, the actual cost for labor is about two-thirds of the cost of the usual method where men must unload the bags from the cars, toss them onto the batches and, at the paver, cut and empty them and bundle the bags. With bulk cement there is never any loss of bags.

Another of the great advantages in handling bulk cement in containers is that the cement is fed into the paver skip with the aggregates instead of going either in the top or the bottom of the skip in one pile, and often causing much difficulty by adhering to the beds.

The Original System

This text will show in words and photographs the original system that was developed and used on a paving job at Woodlands, W. Va., and which proved very satisfactory. Mr. Deardorf is not satisfied with just doing things well but believes that after one has worked out a system, it can be greatly improved in details, using the original system as a foundation.

On the spur track where the cement cars are to be spotted a pair of docks are built at the height of the freight car doors. These are just big enough to contain a Fairbanks scale of sufficient size to hold the cylin-

drical cement cart. The docks are spaced the distance between the doors of two freight cars apart so that when one car is emptied the second dock may be used at once and the trucks kept running on the fastest possible schedule. A gangway connects the two docks so that the men and carts may get from one dock to the other without delay. At a distance of 8 feet from the scales is a three-sided chute counterbalanced so that it can be raised and lowered with the minimum of effort and into which the cement carts dump their loads direct to the Turn-O-Matics mounted on the one-batch trucks. The chute has a lip about 1 foot deep, the angle of which is very important in directing the flow of cement so that there will be no flare-back and hence a loss of cement as the material hits the bottom of the container. The chute is lowered until it touches the transverse baffles in the container when cement is to be discharged and is raised to free the truck.

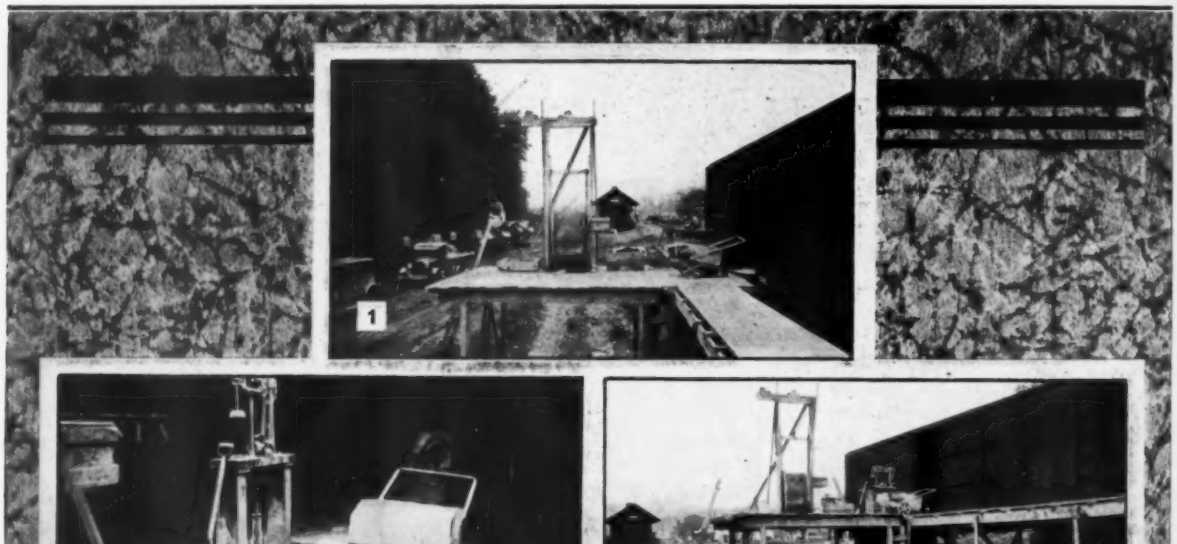
The cement containers have waterproof lids which protect the cement from rains. Should the batches have to be returned to the batcher on account of rains or breakdowns, the aggregates may be dumped to prevent the load having to remain on the trucks, and the cement left in the containers until the operation is resumed.

The cement carts, as mentioned above, are cylindrical, measuring about 4 feet long and 18 inches in diameter with the far end from the pipe handles trimmed into a nose which will fit it on the delivery chute. Two wheels mounted just forward of the center of gravity when the truck is loaded make handling easy. The cart is only about 22 inches high when it is resting on the floor of the freight car ready to be loaded, so that the man in the car has a very small lift when shoveling to the cart. The men in the car become so expert with a very little practice that they judge the volume which will equal the weight of a 7-bag load within a half shovelful. A box with a shovel is kept at the scales to take the extra cement or for make-up as needed.

In operation there are two carts and two men. One man in the car loads the carts and the other wheels, weighs and makes the adjustments and drops the cement into the containers on the trucks. The men alternate at these two operations so that they both get the fresh air at hourly intervals.

THE IMPROVED SYSTEM

Several improvements in this system have been worked out by Mr. Deardorf as the result of study of the original system and practical experience in its operation. These improvements include an elevator 20 feet high, using a cage 6 feet x 6 feet and 6 feet 6 inches high. This cage is lowered to the level of the car door, the cement cart is pushed onto the cage and is then raised to the dumping platform by means of a 15-horse-



THE BULK CEMENT HANDLING EQUIPMENT USED BY THE W. L. JOHNSON CONSTRUCTION CO.

1. View of one dock and its equipment taken from the second dock, 40 feet away, showing the runway between the two docks. 2. One of the cement scoops on the Fairbanks scales. Note the position of the cement make-up box and shovel at the scale. 3. One dock as seen from ground level showing the depressed roadway and the guillotine-type chute for handling the cement from the scoops to the Turn-O-Matic cement boxes mounted on the batch trucks

THE IMPROVED BULK CEMENT HANDLING SYSTEM OF THE W. L. JOHNSON CONSTRUCTION CO. AT LANG SIDING, W. VA.

1. The elevator and cage for transporting the cement carts from the freight cars to the loading platform. 2. The loading platform showing a cement cart ready to be dumped. 3. One of the trucks receiving a batch of cement. Note that the trucks drive under the platform and away on a level road

power gasoline hoisting unit. Here the cement is weighed on a set of platform scales and dumped through the chute into the cement containers on the trucks. The trucks drive under the dumping platform and away on the level road. No pits or dug out runway are required.

It requires five seconds to hoist the cart of cement from the car door to the dumping and weighing platform. All four sides of the elevator is open to permit the carts of cement to enter or leave the elevator from any side. A shed can be erected for storage where needed.

Fast Paving with Minimum Concrete Crew

(Continued from page 60)

The two men who placed the reinforcing fabric in the slab prepared the bottom course for the steel by striking off with a template 2 inches below the top of the slab. When it came time to move the paver hose the two box men and the steel men grabbed the hose and ran it forward between batches.

Behind the finisher there were two hand finishers who floated, and used the wooden belt and touched up the edge as needed. They edged the slab before the last man handled the brooming to roughen the top. This man also cut out the expansion joints and edged them. One man was all that was needed on curing as Curcrete was used with a standard asphalt spray outfit.

WATER SUPPLY

Water was supplied by a Barnes triplex pump located near one end of the job and delivering water through a 2½-inch line with taps set every 200 feet. The paver carried about 150 feet of 2-inch hose.

COMMISSARY

The commissary on this job is operated by Armin Herz, of the Continental Labor Agency, New York. The building is a 14-room frame structure, the lower floor consisting of a kitchen, two dining rooms, a sitting room, pantry and cook's room and the upper floor being used for bedrooms. The work is handled by a man and his wife and includes the cooking for thirty men, serving, preparing lunches for the men and keeping the house in a clean and neat condition.

PERSONNEL

This work was handled by the Rochester Concrete Construction Co., Rochester, N. Y., Oscar J. Heech, President; John Rankin, Vice President; Edson Hill, Secretary and Frank L. Kurtz, Treasurer. The work was under the direct supervision of Edson Hill and Frank L. Kurtz. The Resident Engineer for the New York State Department of Public Works, Division of Highways, was O. J. Pierce.

An article describing the details of construction of the Safe Harbor Dam project in Pennsylvania, the outstanding hydro-electric project in the East, will appear in the September issue of CONTRACTORS AND ENGINEERS MONTHLY.

The Contractor's Accounting System
Part II

By
J. E. Gregory, C. P. A.
Farrington, Hyland & Gregory
Certified Public Accountants
New York City

IN the July, 1931, issue of CONTRACTORS AND ENGINEERS MONTHLY there was outlined the books and the accounts that may, with a reasonable degree of understanding, be put into use by the average contracting organization.

To further a complete understanding of the required routine procedure a series of transactions is herewith given effect upon the ruled forms made a matter of suggestion in that article. The transactions are numbered in order that they may be traced into entry form to the records used.

TRANSACTIONS

(1) *Jan. 2, 1931*—R.G. started in business with a cash capital of $30,000 which was deposited to the credit of R.G. & Co.

(2) *Jan. 2, 1931*—R.G. submitted a bid with a bid deposit of $20,000 on X School.

(3) *Jan. 3, 1931*—R.G. signed a contract to construct the X School for the sum of $500,000.

(4) *Jan. 5, 1931*—R.G. accepted a signed subcontract on the X School job from F.R. in amount of $220,000.

(5) *Jan. 6, 1931*—R.G. accepted a material bid on the X School job from R.M. Co. in amount of $120,000.

(6) *Jan. 6, 1931*—R.G. drew a salary check of $200; paid Mr. X, a draftsman, $50; paid Mr. B, an estimator, $100; paid Mr. L, a bookkeeper, $50; paid Miss F, a stenographer, $35; paid rent of offices for January, $100; received bill for stationery, $25; received bill for office furniture, $250; check drawn for postage stamps, $5; received bills for $8,000 for various items of contracting machinery and equipment and paid at once $2,000 signing notes for $6,000.

NOTE: Further notation of such items, because their treatment is the same has been omitted to save space.

(7) *Jan. 8, 1931*—Paid on account to X Furniture Co. $125; paid S Stationery store in full, $25.

(8) *Jan. 8, 1931*—Negotiated loan of $60,000 from bank, 1½ months.

(9) *Jan. 8, 1931*—Paid payroll on X School job $11,000; January 15, $19,000; January 22, $17,000; January 29, $22,000.

(10) *Jan. 30, 1931*—Received requisition from Subcontractor F.R. in amount of $60,000; received Material bill from R. M. Co. in amount of $25,000.

(11) *Jan. 31, 1931*—Requisitioned $190,000 on account of X School contract.

(12) *Feb. 10, 1931*—Received on requisition No. 1

R.G. & CO.
CASH DISBURSEMENTS, CONTRACTS PAYABLE, BILL PAYABLE AND COST AND EXPENSE REGISTER

ENTRY DESIGNATION	DATE	EXPLANATION	CHECK #	BANK WITHDRAWALS	ACCOUNTS PAYABLE ADMINISTRATIVE CREDITORS PAID	ACCOUNTS PAYABLE ADMINISTRATIVE CREDITORS BILLS	ACCOUNTS PAYABLE MATERIAL CREDITOR PAID	ACCOUNTS PAYABLE MATERIAL CREDITOR BILLS	SUBCONTRACTS PAYABLE PAID	SUBCONTRACTS PAYABLE REQUISITION	SUBCONTRACTS PAYABLE UNREQUISITIONED REQUISITIONED	SUBCONTRACTS PAYABLE UNREQUISITIONED UNREQUISITIONED
1	1/1/31	BID DEPOSIT ON X SCHOOL	1	$ 20,000								
4	1/5/31	F.R. SUBCONTRACT ON X SCHOOL										220,000
5	1/6/31	R.M.CO. MATERIAL PURCHASES ON X SCHOOL										
6	1/6/31	R.G. SALARY	2	200								
		MR. X DRAFTSMAN	3	50								
		MR. B. ESTIMATOR	4	100								
		MR. L. BOOKKEEPER	5	50								
		MISS F. STENOGRAPHER	6	35								
		RENT OF OFFICES-JANUARY	7	100								
		STATIONERY BILL				25						
		OFFICE FURNITURE BILL				250						
		CASH - STAMPS	8	5								
		MACHINERY & EQUIPMENT BILL				8,000						
		¼ OF MACHINERY & EQUIPMENT BILL	9	2,000	8,000							
9	1/8/31	X FURNITURE CO. ON A/C	10	125	125							
		S STATIONERY STORE-IN FULL	11	25	25							
9	1/8/31	PAYROLL X SCHOOL	12	11,000								
	1/15/31	PAYROLL X SCHOOL	13	19,000								
	1/22/31	PAYROLL X SCHOOL	14	17,000								
	1/29/31	PAYROLL X SCHOOL	15	22,000								
10	1/30/31	F.R. REQUISITION #1 X SCHOOL								60,000	60,000	
		R.M. CO. REQUISITION #1 X SCHOOL						25,000				
19	2/10/31	F.R. REQUISITION #1 LESS 10%	16	54,000					54,000			
18	2/11/31	R.M. CO. REQUISITION #1 LESS 2%	17	24,500			25,000					
16	2/12/31	A.P. STEAM SHOVEL HIRE						1,350				
17	2/12/31	COMMISSION ON X SCHOOL JOB	18	1,500								
18	2/12/31	⅓ OF BANK NOTES	19	10,000								
		INTEREST ON $ 50,000	D.M.	375								
19	2/13/31	⅓ OF MACHINERY & EQUIPMENT NOTE	20	1010								
21	2/15/31	X SCHOOL COMPLETED										
				CREDIT	DEBIT	CREDIT	DEBIT	CREDIT	DEBIT	CREDIT	DEBIT	CREDIT

This Ledger Form Should Include Columns Payroll Accounts, Overhead Distributed, Bank Transfers, Entertaining and Promotional

The following entries on this ledger form, right hand page, are credits and should be so indicated. Notes Payable, $6,000;

R. G. & CO.
CASH RECEIPTS, CONTRACTS RECEIVABLE AND INCOME REGISTER

ENTRY DESIGNATION	DATE	EXPLANATION	BANK DEPOSITS	ACCOUNT RECEIVABLE: REQUISITIONED	ACCOUNT RECEIVABLE: RECEIPTS	NOTES PAYABLE	INTEREST EXPENSE	SIGNED CONTRACTS RECEIVABLE: UNREQUISITIONED	SIGNED CONTRACTS RECEIVABLE: REQUISITIONED	RESERVE COVERING UNCOMPLETED CONTRACTS: COMPLETED	RESERVE COVERING UNCOMPLETED CONTRACTS: IN PROGRESS	COMPLETED CONTRACTS & JOBS	BID DEPOSITS	OTHER ACCOUNTS: CHARGES	OTHER ACCOUNTS: CREDITS
1	1/2/31	INVESTMENT	30,000												30,000
3	1/3/31	X SCHOOL CONTRACT						500,000			500,000				
4	1/6/31	BANK LOAN	59,550			60,000	450								
11	1/9/31	REQUISITION #1 X SCHOOL		190,000					190,000						
12	1/10/31	CASH-REQUISITION #1 LESS 10%	171,000		171,000										
13	1/10/31	BID DEPOSIT RETURNED	20,000											20,000	
20	1/30/31	FINAL REQUISITION-X SCHOOL		160,000					160,000						
22	1/30/31	X SCHOOL COMPLETED								500,000		500,000			
			DEBIT	DEBIT	CREDIT	CREDIT	DEBIT	DEBIT	CREDIT	DEBIT	CREDIT	CREDIT	CREDIT	DEBIT	CREDIT

Columns Notes Receivable, Notes Receivable Discounted, Interest Income, Bank Transfers, Sales of Material and Loans and Advances Payable Were Omitted Because of Lack of Space

X School $171,000, representing full approval of requisition less 10 per cent retainage.

(13) *Feb. 10, 1931*—Received a return of Bid Deposit $20,000.

(14) *Feb. 11, 1931*—Paid Subcontractor F.R. $60,000 less 10 per cent retainage or a net of $54,000.

(15) *Feb. 11, 1931*—Paid material bill of R. M. Co. less 2 per cent cash discount or $24,500 net.

(16) *Feb. 14, 1931*—Received bill of A.P. covering hire of steam shovel, etc., $1,350.

(17) *Feb. 15, 1931*—Paid commission for getting X School job $1,500.

(18) *Feb. 23, 1931*—Paid off on bank note $10,000; renewing note for $50,000, 1½ months.

(19) *Mar. 6, 1931*—Paid off on equipment note $1,000 and interest thereon for 2 months $10 or a total of $1,010.

Although the writer has treated of but one job it is possible that any number of contracts might have been engaged during the period. In all cases the procedure is exactly similar and all new engagements and events are recorded chronologically upon the registers with no attempt at segregation by separate pages.

Method of Accounting

Assume now that a period of six months has elapsed, that the records are kept as currently indicated, that the footings of each column have been posted monthly to the general ledger in accord with the detail procedure set forth in the July article, and that under date of September 6 the final requisition is sent, is approved, and the job is considered completed.

The total accumulated costs of the X job as posted monthly from the Cost Register are to be eliminated from Jobs in Progress and charged into Cost of Jobs Completed. This may be accomplished upon the Cost Register as indicated in entry No. 21 or the same entry may be made upon the journal. If the total costs were as indicated upon these illustrative registers the entry would be:

Charge cost of job completed	$430,000	
Credit cost of jobs in progress:		
Labor		$250,000
Materials		100,000
Subcontracts		75,000
Equipment charges		2,000
Other charges		3,000

Simultaneously with the closing of the cost entry the entire Reserve covering Uncompleted Contracts (together with all extras therein, which are treated, as they occur, as additional contracts) is closed into Income from Completed Contracts and Jobs. In this case the amount exclusive of extras happens to be $500,000. The entry is as shown upon the Income Register under No. 22.

As the individual bookkeeper becomes familiar with the use of the suggested combination forms he will of course make such changes as suit his particular fancy. The writer appreciates fully the fact that most accountants are cursed with certain pet foibles, any deviation from which tends toward criticism. The suggested system, outlined carefully in a previous issue and more completely formulated above, has proved most satisfactory to one who has chosen this field of specialized endeavor as a study.

ACCOUNTS PAYABLE MATERIAL PURCHASES COST UNBILLED: BILLED	ACCOUNTS PAYABLE MATERIAL PURCHASES COST UNBILLED: UNBILLED	COST OF JOBS SUBCONTRACTED: UNREQUISITIONED	COST OF JOBS SUBCONTRACTED: REQUISITIONED	MATERIAL COSTS PURCHASES COSTS UNBILLED: UNBILLED	MATERIAL COSTS PURCHASES COSTS UNBILLED: BILLED	COST OF JOBS IN PROGRESS: LABOR	COST OF JOBS IN PROGRESS: MATERIALS	COST OF JOBS IN PROGRESS: SUBCONTRACTS	COST OF JOBS IN PROGRESS: EQUIPMENT CHARGES	COST OF JOBS IN PROGRESS: OTHER OVERHEAD	BID DEPOSITS	NOTES PAYABLE	INTEREST EXPENSE	ADMINISTRATIVE EXPENSE	PLANNING & DRAFTING EXPENSE	OTHER ACCOUNTS: CHARGES	OTHER ACCOUNTS: CREDITS
											20,000						
	120,000	220,000		120,000													
														200			
															50 -		
															100 -		
														60			
														85			
														100			
														25			
														5		250	
																2,000	
												6,000					
						11,000											
						12,000											
						17,000											
						22,000											
25,000			60,000		25,000		25,000	60,000									
																	500 -
									1,350								
										1,500							
												10,000					
												1000		375			
														10			
DEBIT	CREDIT	DEBIT	CREDIT	DEBIT	CREDIT	250,000 DEBIT	100,00- DEBIT	75,000 DEBIT	2,000 DEBIT	3,000 DEBIT	DEBIT	DEBIT	DEBIT	DEBIT	DEBIT	430,000 DEBIT	CREDIT

Expenses and Indirect Job Costs in Which There Were No Entries and Which Were Omitted Because of Lack of Space
Cost of Jobs in Progress, Labor, $250,000, *Materials,* $100,000, *Subcontracts,* $75,000, *Equipment Charges,* $2,000, *Other Overhead,* $3,000.

A Compact Hot Mix Plant

Six Miles of Mixed Macadam Laid with Unusual Speed by Canada Paving & Supply Corp. Ltd., at Ingersoll

WITH a Cummer 2,500-yard plant and no auxiliary drier or other equipment and dispensing with the second bucket feed to the drier, the Canada Paving & Supply Corp., Ltd., of Windsor, set a fast pace and kept it up on a 6-mile job in central Ontario running south from Ingersoll. The asphalt plant was set up on a siding at Salford in the minimum of space and with the maximum of runway for the trucks so that they lost no time in approaching the mixer for their loads and making a quick getaway.

This plant used mixed stone running from ⅜ to 1-inch in size which was shipped in gondola cars from Hagersville. Screenings were similarly handled from a quarry at Dundas. These were spotted on the main siding at Salford and were unloaded to a stockpile by a McMyler-Interstate steam crawler crane with a 1½-yard clamshell bucket. Alternate buckets of stone and screenings were dropped behind a wooden bulkhead through which the mixture was fed to the bucket elevator of the Cummer plant to the standard 40-ton drier. From the drier the material was taken by the hot elevator to the storage bins after being screened into dust and stone again. A novel device was rigged by the inspector so that the men controlling the flow of material to the cold elevator could tell quickly whether the bins were both filled the same amount. It was a sounding device with weights and indicators which showed quickly when one weight dropped and pulled its indicator out of sight that the material in that bin was low and needed replenishing promptly.

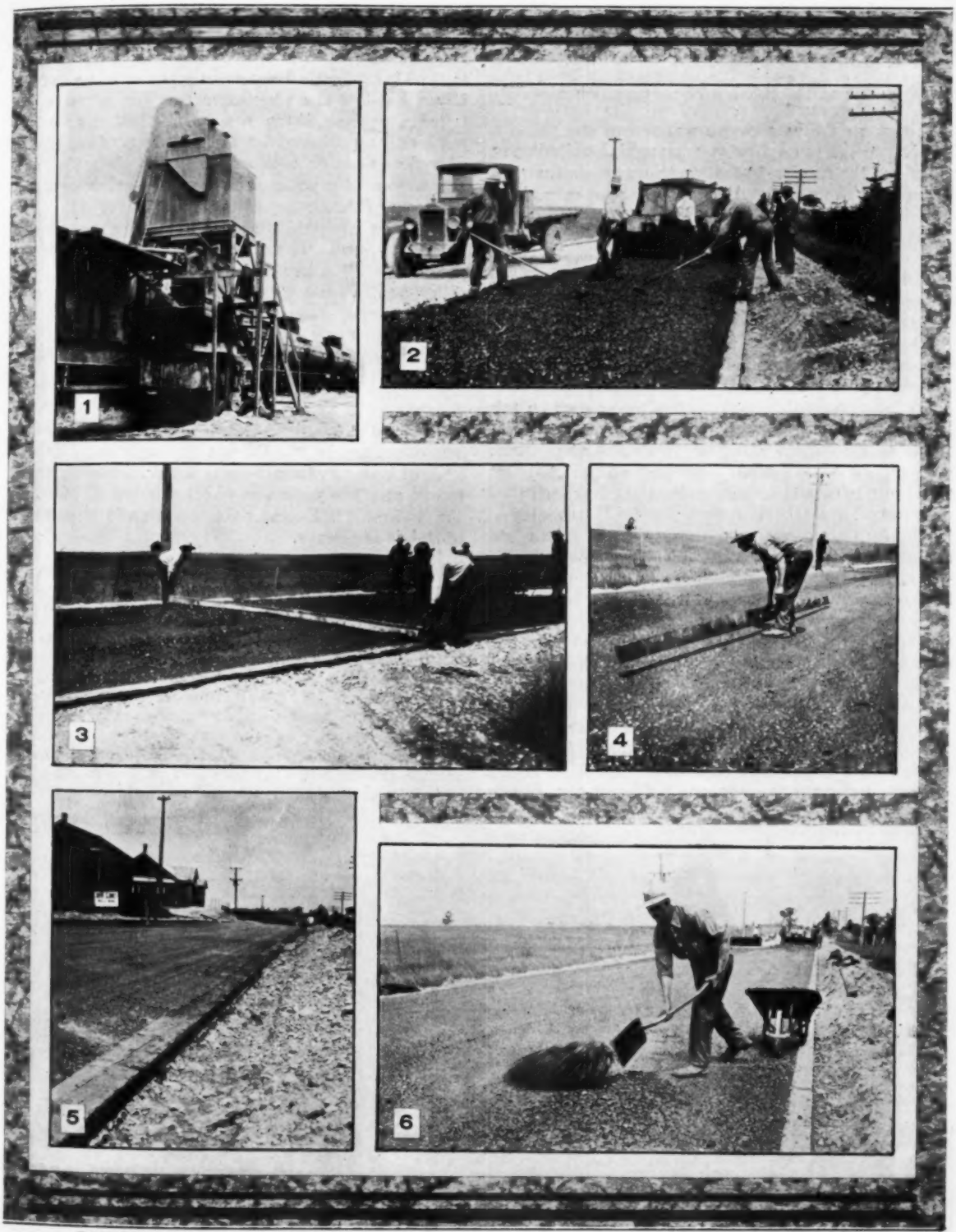
The plant turned out 1,000-pound batches consisting of: for top, 300 pounds of fines, 650 pounds of stone, and 50 pounds of asphalt; for base, 275 pounds of fines, 675 pounds of stone and 50 pounds of asphalt. The asphalt used on this job was furnished by Imperial Oil, Ltd., with a penetration of 71 to 80. Shipments were made from Montreal. The entire plant was run by a steam engine located at the asphalt kettle end of the plant and operated by the same boiler which heated the kettle, asphalt cars and ran the asphalt pump. The batches were delivered to the hauling trucks at a temperature of about 300 degrees Fahrenheit, there being nine or ten batches to a load.

The operating crew for the plant consisted of two men in the aggregate cars to clean up, a crane man and a fireman on the crane, a man on the stockpile to watch the mixing of the stone and screenings and see that the hot bins were properly filled, a burner man attending the drier, one man on the asphalt tank cars and fuel oil tank who also brought up coal for the engine, one engineer on the boiler and engine, one man checking truck time for the contractor, and the asphalt and stone man on the mixer. The plant was equipped with a 1,500-pound pug mill mixer but the steam engine was not powerful enough to turn it at the right pace so the batches were reduced to 1,000 pounds.

The trucks pulled up to an oil drum on every third trip to oil the bodies. The oiling device was novel in its simplicity. It consisted only of an old oil drum with a hose attached near the bottom. The drum, set at an elevation of perhaps 5 feet above the truck bodies, had sufficient head to give a considerable spray through the flattened pipe inserted in the end of the rubber hose. The feed and shut-off were controlled solely by lowering and raising the nozzle. After spraying with the oil the truck bodies were raised to dumping position to allow the oil to drain out and not remain in any pools to cut the asphalt of the mix. The trucks were not covered with tarpaulin on the short hauls, but when rain threatened or the haul became unduly long they were covered.

The superintendent had devised a special asphalt bucket which did away with much of the splashing and blowing of the asphalt so common in the old type dump buckets. The bucket was roughly V-shaped with the point cut off and made the bottom of the bucket. At each end of the bottom were round holes plugged with cones. When the asphalt was weighed and ready to dump, a lever on the top of the bucket was dropped, raising the two cones and permitting the asphalt to run in two streams to the mixer. The large pipe from the pneumatic lift for the asphalt was carried well into the

bucket to prevent blowing of the stream when delivering material to the weighing bucket. The plant, when in full operation, used about one 30-ton car of asphalt per day in producing 600 tons of hot mix for the road



PAINSTAKING CARE IN PREPARING THE SURFACE OF A MIXED MACADAM PAVEMENT IN ONTARIO

1. Truck beneath mixer receiving batches of hot mix. 2. The raking gang trimming the material as laid with steel spreader boxes. 3. Constant checking of the cross section of the pavement with the template insured a uniform pavement. 4. Checking the pavement during rolling with a 20-foot straightedge to insure smooth riding. 5. The 3 x 6-inch forms moved in 6 inches for spreading the top. 6. Filling in low spots shown up by the straightedge during rolling

which ran 750 feet of completed road in 10½ hours. The plant was set up and ready to run three days from the time the freight was spotted on the siding. The plant began operation on June 5 while the grading operations on the road started June 3 with a 6-foot blade grader pulled by a Caterpillar Thirty and a hand crew of five.

CAREFUL PLACING AND STRAIGHTEDGING

As soon as the base course was spread and rolled a 20-foot wooden straightedge was used longitudinally as well as the regular 20-foot template across the road for crown. The straightedge was made with extra thick ends for about 8 inches to prevent wearing down the board too quickly, as it was frequently rubbed rather hard on the mix to be sure that the ends were resting on firm material. The constant use of this piece of equipment with chalk marks to indicate the low spots and crosses to show the high spots made the road a great improvement over the usual road of this type, although they are well laid throughout the province of Ontario and ride comfortably at all reasonable speeds.

The usual type of forms or screeds were used on this job, 3 x 6-inch pine timber 16 feet long staked in three places on the outside with iron pins measuring ¾-inch x 15 inches. The screeds were laid up to 1,500 feet ahead of paving and as soon as base had been run they were moved in 6 inches on each side for the running of top. There were two men laying screeds ahead and then falling back to move them in. Two Galion asphalt spreaders were used, one on each side of the road, both for base and top. One man handled the boxes making the adjustments needed as the work progressed, particularly on the base and giving a thicker spread when required. He also attached the 5-foot chain to the truck on the inside and one of the four rakers attached the outer chain. The truck was turned on a Blaw-Knox turntable just ahead of the paving and backed to the spreader box designated by the box man. The truck emptied half its load into the box, lowered its body and pulled ahead until the box was nearly empty, then it emptied the remainder of its load and left the box standing. While the next truck was backing into position the two men who worked back with the straightedge man shoveled some of the mix into two wheelbarrows and wheeled it back to touch up the low spots.

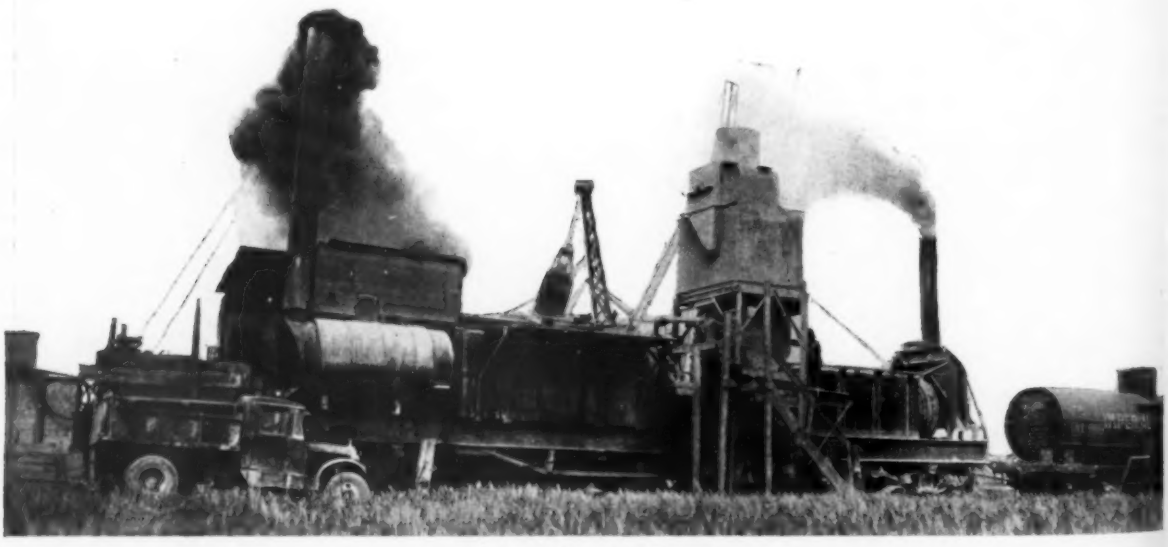
There were two rakers on the newly spread material and the two back touching up. Three shovel men worked immediately behind the spreader boxes and the others handled the wheelbarrows. The hot mix was rolled with two 10-ton gas rollers, both three-wheel machines, a Galion and a Huber. The rollers carried fiber door mats on each roll to spread the water from the perforated pipes evenly over the surface and prevent any of the hot asphalt sticking to the rolls. The rollers were equipped with a tank either above the cab or on the front. These were filled from a water cart equipped with a hand pump which was used by the roller men. A fire wagon was kept on the grade just ahead of spreading in which the men placed their shovels and rakes to keep them clean. When a tool was removed from the fire wagon it was dipped in a nearby pail of fuel oil.

PERSONNEL

This 6-mile mixed macadam job, Contract No. 31-20, was completed by the Canada Paving & Supply Corp., Ltd., of Windsor, Ontario, with M. W. O'Neil as Superintendent. The work was directed by H. E. Macpherson as Resident Engineer for the Ontario Department of Public Highways.

Tarred Crushed Rock Shoulders on Narrow Roads

IN order to make narrow paving safer, the Minnesota State Highway Department is building 2-foot shoulders of tar-treated crushed rock on the highway between Anoka and Elk River. This pavement, which is 18 feet wide, carries heavy traffic and cars going outside the concrete have made it difficult to maintain the earth shoulders in safe condition. The bituminous rock widening is expected to make the pavement safer and more serviceable, besides reducing the cost of shoulder maintenance. The work is of an experimental nature and if found satisfactory, will be continued on other 18-foot pavements.

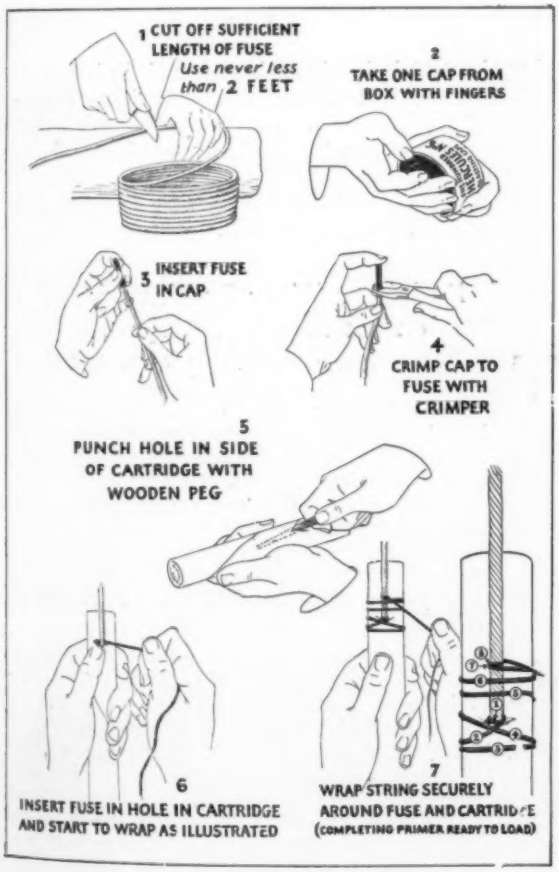


The Hot Mix Plant Layout

A Blasting Cap and Fuse Are Used in Two of the Methods Described and an Electric Blasting Cap in the Third

Three Methods of Making a Primer

EVEN though well-made primers are of first importance in securing efficient blasting, they are often poorly prepared. Through the courtesy of *The Explosives Engineer* we are able to present to our readers two methods of making a primer with blasting cap and fuse and a simple method of making a primer with an electric blasting cap.


1 CUT OFF SUFFICIENT LENGTH OF FUSE
Use never less than 2 FEET
2 TAKE ONE CAP FROM BOX WITH FINGERS
3 INSERT FUSE IN CAP
4 CRIMP CAP TO FUSE WITH CRIMPER
5 PUNCH HOLE IN SIDE OF CARTRIDGE WITH WOODEN PEG
6 INSERT FUSE IN HOLE IN CARTRIDGE AND START TO WRAP AS ILLUSTRATED
7 WRAP STRING SECURELY AROUND FUSE AND CARTRIDGE (COMPLETING PRIMER READY TO LOAD)

Priming a Cartridge in the Side

Crimping

The fuse should be cut square with a sharp knife or the cutting jaws of a cap crimper into lengths sufficiently long for safety. If the fuse has been exposed to moisture, cut the first one-half inch off before inserting it into the cap. Remove the top from the box of blasting caps, then place the hand over the box covering all the caps except one, which is allowed to slip gently into the free hand. Do not try to pick caps out of the box with tweezers, nails, or any sort of device, as they may be exploded accidentally.

Next, slip the cap carefully over the end of the fuse, taking care not to push the fuse very hard against the explosive charge loaded in the bottom of the cap. Do not twist the fuse in inserting it. After the fuse has been pushed to the top of the explosive charge in the cap, make a crimp at the top of the open end of the cap by using a cap crimper. A glance at the illustration will show exactly how this is done. The crimp made with the cap crimper is better and safer than can be made in any other way. If the primer is to be used in a wet bore hole smear some hard tallow or soap over the joint between the cap and the fuse.

Priming

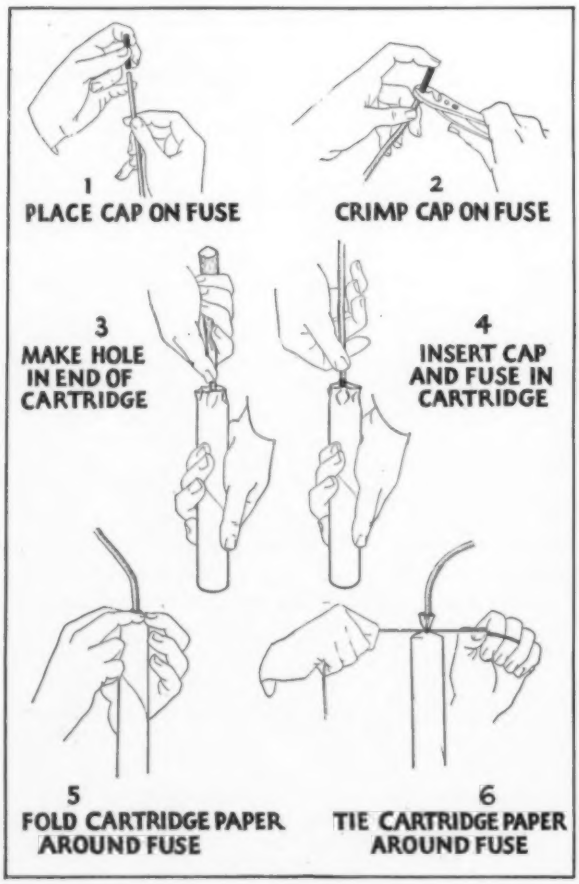
There are two ways of priming, known as "priming in the side" and "priming in the end." When priming in the side of a cartridge, the hole should be punched diagonally into the side of the cartridge about 2 inches from the end. This hole should so incline that the part to be occupied by the cap will be nearly parallel to the sides of the cartridge and should be deep enough to contain the cap. The cap should be pointed toward

the charge and it should be completely within the priming cartridge. Place the cap in the hole in the cartridge. Take a string about 20 inches long, wrap it twice around the fuse, one time around the cartridge below the hole and then twice around the cartridge and the fuse and finish with two or three wraps around the fuse. The primed cartridge is now ready to be placed in the bore hole.

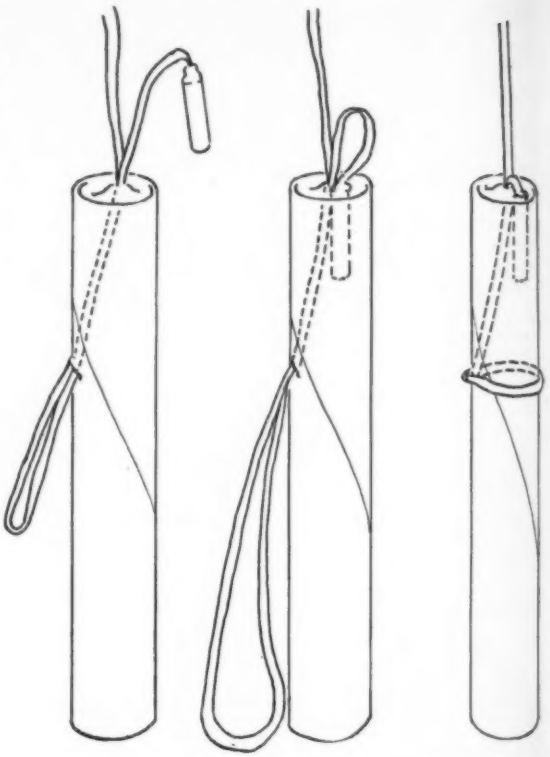
In the end priming method the paper is folded back at one end of the cartridge and a hole made with a wooden punch about the size of a lead pencil into the exposed dynamite. The cap with the fuse attached is then inserted into this end and the paper is drawn together and tied tightly. In very wet work, the lower end of the fuse and the paper which has been tied around it should be covered with soap, tallow, or heavy grease to make it waterproof. Never use oil or thin grease for this purpose. This method of priming is considered decidedly the best under the condition mentioned.

PRIMING WITH AN ELECTRIC BLASTING CAP

A method of priming with an electric blasting cap which avoids tying with twine or making a half hitch is to punch two holes in one end of the cartridge, one of the holes straight in and the other coming out through the side of the shell about 2 inches below the end. A sharp fold is made in the electric blasting cap



The Method of Priming a Cartridge in the End



The Method of Making a Primer with an Electric Blasting Cap

wires about 18 inches from the cap, and the bent wires pushed through from the end of the cartridge and coming out through the side. The fold in the wires is then opened out to form a loop and this loop is passed over the other end of the cartridge. The cap is inserted in the hole punched straight into the cartridge and then all the slack in the wires is taken up.

Building a River Breakwater on the Missouri River

THE Chicago, Milwaukee, St. Paul & Pacific Railroad found it necessary to build a breakwater on the Missouri River at Chamberlain, S. D., to protect its right of way. To build this breakwater a Link-Belt K-2 crane with a 50-foot boom was used which walked 4½ miles from the main line siding to the job. It pulled a skid carrying other necessary equipment, including tools and the boiler for furnishing steam to the steam hammer. The total skid load was about 8 tons. As there was no road to drive over, the machine was driven through the willow growth which was very thick and dense, ranging from ½-inch to 1½ inches in diameter and from 10 to 20 feet tall.

After reaching the job, the leads were assembled and the piles were driven about 2¼ miles from the railroad switch, their purpose being to keep the Missouri River from working its course toward the bridge approach and possibly washing it away. Approximately 640 piles were driven two deep on 8-foot centers. The pilings were cut level after being driven and planking was then placed on top for the machine to work on and walk over instead of risking its breaking through the ice on the river and getting into the quicksand. The work was supervised by J. M. Hayes, General Superintendent of Work Equipment, Chicago, Milwaukee, St. Paul and Pacific Railroad.

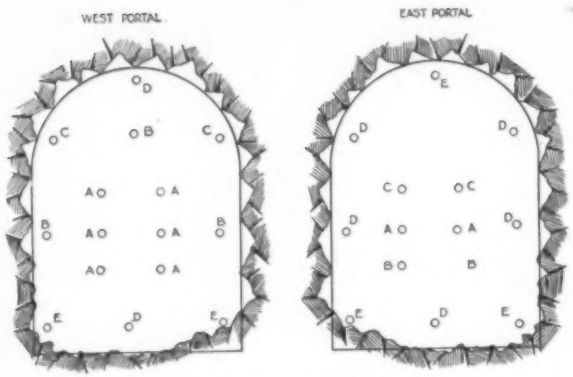
A Horseshoe-Section Tunnel *for a* Gravity Sewer *and* Other Utilities

Construction of a 6,800-foot Bore in Shale and Trap Rock by the DiMarco Contracting Co., in West Orange, N. J.

FACETIOUSLY referred to as "O'Connor's Bore" the Ludington Road Tunnel outlet for the sewers in the area between First and Second Mountains in the town of West Orange, N. J., comprising 3,200 acres, is now under construction. The problem faced by the Town and its consulting engineer was whether to construct a 4-mile gravity line around First Orange Mountain, a shorter pressure line over the mountain with its attendant constant pumping costs, and the possibility of a break in the line above a local water supply reservoir, or to burrow through the mountain and provide a tunnel sufficiently large to carry the sewer and other utilities such as telephone and telegraph cables and water and power lines. The pumping scheme involved the least first cost and ultimately greatest annual cost. The gravity line around the mountain was the simplest and cheapest project, if not weighted with threatened exactions from the City of Orange involving a long litigation. The tunnel scheme involved less conflict with the adjoining mu-

DRILLING OPERATIONS AND MUCK HANDLING AT THE WEST HEADING OF THE LUDINGTON ROAD TUNNEL, WEST ORANGE

1. *A drill set-up in front of the west heading at Sta. 47.* 2. *One of the muck trains hauling rock upgrade at the west tunnel, showing in the background from left to right the administration building, dry house, blacksmith shop and compressor house.* 3. *The drill crew at the west heading.*



FIRING DIAGRAMS

A—Cut holes, fired direct *C—Second relay*
B—First relay *D—Third relay*
E—Fourth relay

nicipalities, and probably will, in the end, prove the most economical. Frank A. O'Connor, Commissioner of Public Works of West Orange, literally "bored" his colleagues with his enthusiasm for the tunnel project until finally the economics and safety of this plan were definitely established, backed by an unqualified recommendation of Alexander Potter, Consulting Engineer for the project, and the contract was awarded on December 29, 1930, for the sum of $260,266.25. Work was started by the DiMarco Contracting Co., of White Plains, N. Y., on January 8, 1931, under a penalty clause which requires the completion of the work in ten months with a penalty of $2,500 per month after the close of the contract period. Construction equipment, including compressors and excavating units, were assembled within two weeks and excavation actually started.

The area over the tunnel is sparsely inhabited. The first 3,000 feet from the west end is in Essex County Park, then follows about 300 feet of houses with the remainder of the tunnel under golf courses and farms, except the last 1,200 feet which is through a street in an exclusive residential section of the town. Under the golf course, the tunnel is about 308 feet below the surface, so that blasting does not disturb even the most nervous duffer.

The tunnel which is approximately 6,800 feet long is horseshoe shaped, measuring 5 x 7 feet at the west end and 5 x 6½ feet at the east end, where concrete lining is necessary because of the soft shale and frequent sand pockets. The tunnel slopes on a 1.2 per cent grade from west to east, permitting gravity drainage at the east portal and requiring constant pumping during construction at the west portal.

Operations at the West Portal

Drilling and mucking are alternated throughout three 8-hour shifts at the west portal where the progress has averaged 22 feet per day through hard trap rock with few seams or faults. At one point, however, approximately 350 feet from the west portal, a soft pocket was struck in the trap rock, running off 20 feet to one side and 40 feet to the other side and 20 or 25 feet above the tunnel roof. This was timbered and will be concreted after the tunnel is holed through. The best week's progress on the west end has been 169 feet and the best day 30 feet. It is expected that this will be bettered before the tunnel is holed through. The west portal tunnel crew consists of a foreman and six men drilling and mucking, one pump man and one electrician for each of the three shifts. Three I-R N-75 drifters are used set up on a post and a jackhammer for pin holes. One stoper is also used for making the holes for the engineer's lines. The heading holes are drilled 6, 8 or 10 feet deep per round and are then loaded with 60 per cent du Pont dynamite and shot by a switch on the 220-volt line. As shown in the accompanying diagram, six holes are shot direct and the remainder in four relays.

Mucking

An Atlas storage battery locomotive with two sets of Exide batteries, one of which is being charged while the other is in service, operates on a 24-inch track from the dump downgrade into the tunnel, hauling four Atlas side-dump mine cars. These cars were especially equipped with Timken bearings because of the heavy grade, which otherwise would have required a larger locomotive. An air-operated mucking machine developed by the Sullivan Machinery Co., from designs of the superintendent, is used. It consists of a 4-wheel truck mounting an air hoist which operates a scraper running out into the muck and up an apron in front, past the hoist, onto a slotted platform which extends the length of one industrial dump car. In order to clean up the entire face with this machine, immediately after the shot, three pin holes are drilled with a jackhammer near the top of the face and eye-bolts set in them to hold the pulley through which the cable operating the scraper is run. With this machine the 1-yard cars are loaded in about 2 minutes. The contractor has raised the sides of the cars about 6 inches, so that the heaping load which is pulled out in each car is about 1½ yards. Each shot brings down enough material to fill about 18 cars which are loaded and pulled out of the tunnel in approximately 1¼ hours.

The tunnel is widened at one point about 200 feet from the portal for a switch where the mucking machine is stored during drilling. Another widening on the opposite side of the tunnel contains a set of tunnel tongs operated by a Yale chain block. This is used for lifting empties from the rear of the storage battery locomotive and placing them on the track in front of the locomotive. The contractor originally intended to use a compressed air hoist on this line, but through some misunderstanding in design, the hoist was delayed and finally the order cancelled as it was found that the chain block could be operated so rapidly that the added expense for the hoist was not warranted.

Service Lines in Tunnel

A 24-inch reinforced concrete sewer pipe which is to be part of the finished line has already been laid with its subdrains down the slope to within 150 feet of the portal. A considerable amount of water running under this pipe and through the open cut just west of the tunnel drains into a sump at the portal. A La Bour 4-inch self-priming electrically-operated centrifugal pump delivering 500 gallons per minute against a 50-foot head, is installed at this point, to take care of

water entering the tunnel from the outside. There is also a 4-inch gasoline-motor-operated centrifugal pump at the portal as an emergency unit in the event of a power shut-down or a heavy flow which would exceed the capacity of the electrical pump. The other 2-inch La Bour electrically-operated centrifugals are installed at other points in the tunnel.

A 3-inch pipe for air at 110 pounds pressure for the drills is installed in the tunnel with a 1-inch water line for the drills tapped from the town supply. An 8-inch vent pipe installed along the roof is attached to a Connellsville blower with a capacity of 11,000 cubic feet of air per minute, which operates as a suction or vacuum fan. Thus, the gases are confined to the heading and the tunnel clears up very quickly.

The operating utilities for the west portal heading are placed as follows: a 3-inch compressed air pipe and the 1-inch water line for the drills at the lower left hand corner; the 24-inch gage industrial track in the center; and the 2-inch discharge or suction pipe for drainage in the lower right-hand corner, above at the left are the lighting wires, as one faces the heading; and at the right the 8-inch ventilating pipe with the blasting wires hung immediately below it.

Because of the high suction on the 8-inch vent pipe, stones which were thrown into the pipe by the blast were in many instances sucked the entire length of the pipe and caused trouble at the blower. These stones also battered the end of the pipe, causing additional friction and a reduction in cross section which decreased the effectiveness of the ventilation system. To obviate this, a metal cone of ¼-inch material was welded with prongs which slip inside the pipe to hold the cone in place. The cone deflects rock from the blast and has effected considerable saving in operation as it has minimized shut-downs.

A 4,400-volt transmission line is carried to the portal where it is stepped down to 220 volts, 3-phase and carried in 500 feet where it is transformed to 110 volts. Fifty-watt electric lights are spaced 35 feet apart on the 220-volt circuit and 15 feet apart on the 110-volt circuit. The mortality of the bulbs was about 7½ dozen per week, due to blasting and also in large measure to carelessness on the part of the workmen in the tunnel. This loss was materially reduced when wire shields were placed around the lights.

SURFACE PLANT

The buildings near the portal include the contractors' and engineers' office, a storeroom, compressor and blower house, blacksmith shop and dry house. The surface crew consists of compressor man, a blacksmith and helper, a dump man, a timekeeper and an assistant engineer. Compressed air is furnished by a 625-cubic foot I-R compressor driven by a 108-horsepower General Electric motor. A GE motor generator set, located in the battery house alongside the industrial railway track to the dump, charges the set of batteries not in use.

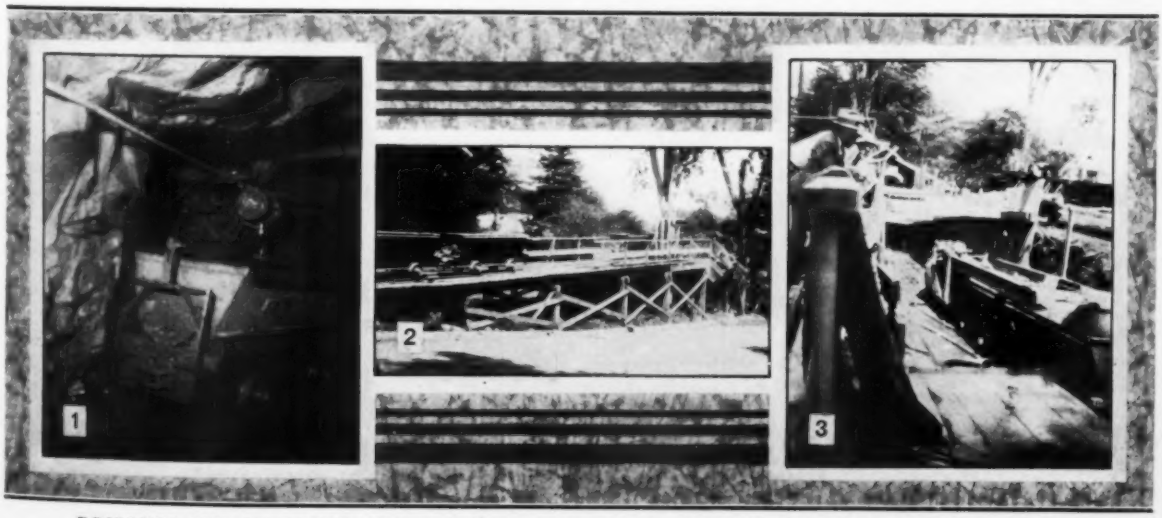
The blacksmith shop is equipped with two oil-heated forges which heat the drill steel for the one large pneumatic sharpener. A second smaller sharpener is installed, equipped with a jackhammer die so that it is not necessary to change the dies on the larger machines for different types of steel.

Coffee is made continuously so that it is always available for the drillers when they come out after a blast and go to the dry house. The contractor has also rigged up the cooling water from his compressor so that hot water is always available for use in the camp immediately outside of the compressor house.

A Keystone well driller is used to put down 8-inch holes from the surface for lines and ventilation at such points where the tunnel is not too far below the ground surface.

WORK AT EAST PORTAL

Inasmuch as the east portal is located in the center of a residential district great care has been taken to minimize any possible damage. The work in this section is in a soft shale which permits a progress of only



DRILLING AND MUCKING OPERATIONS AT THE EAST HEADING OF THE LUDINGTON ROAD TUNNEL, WEST ORANGE, N. J.

1. *A "cherry-picker" with car.* 2. *The loading trestle at the east portal showing the chute down which spoil is dumped to trucks.* 3. *The mucking machine and muck cars used at the east heading of the tunnel.*

12 feet per day on one shift from 7 A. M. to 6 P. M. The total average for both headings has been about 200 feet per week, which will permit holing through about October 1, 1931.

The east portal crew consists of a foreman and seven men, a truck operator and a mechanic. Work proceeds in much the same manner as at the west end. A Sturtevant blower is installed for ventilation and a 415-cubic foot I-R compressor operated by a 75-horsepower GE motor is used to supply air for the drills. No pumps are necessary, as drainage is by gravity running into a manhole through an 8-inch pipe. The surface crew is similar to that on the west end except that there is no blacksmith and helper.

The tunnel in the east end is lined with 8 x 8 timber at the start in earth and then reduced to 3 x 10-inch timber as the rock became harder. The tunnel is dry packed to prevent the falling of loose rock. It will later be lined with concrete as a permanent protection. The drilling diagram and blasting sequence at the east portal includes 6 holes located centrally in the tunnel, 3 spaced equally across the bottom of the tunnel and 5 others around the arch. They are fired as shown in the accompanying diagram.

The best day at the east heading was about 23 feet and at the west portal 30 feet. Mucking at the east portal was first handled entirely by hand to Atlas dump cars which are run out onto a trestle and dumped into a Ford truck which hauls it down hill to an extensive swampy fill about ¼-mile distant. Later a mucking machine similar to that used at the west end was installed.

PERSONNEL

The construction work described in this article on the Ludington Road Tunnel is being handled by the DiMarco Contracting Co., White Plains, N. Y., Antonio DiMarco, President, and John J. Sullivan, Secretary-Treasurer, with C. C. Freeman, as Superintendent. Alexander Potter, 50 Church Street, New York, is Consulting and Chief Engineer for the project which is being constructed under the direction of the Department of Public Works of West Orange, Frank A. O'Connor, Commissioner. Jacob L. Lenox was the Resident Engineer for the consultant from the inception of the work until injured in March and since that time S. G. Hess has been the Resident Engineer.

Railroad Plant Produces Concrete When and Where Needed

(Continued from page 50)

Water for the mixer is carried in an extra locomotive tender ahead of the mixer car to which the mixer feed-pump suction is connected. A batchmeter times the mix. A steam hose in the water tank keeps the water supply warm in winter and a torch heater inserted in the loading side of the mixer heats the concrete during mixing in cold weather.

LIGHTING SYSTEM

A 750-watt portable electric light plant is mounted in the coal section of the extra tender and the cable is carried to outlets on each of the cars. Above the mixer is mounted a floodlight which illuminates the concrete chutes and forms for night work. Each aggregate car has a floodlight at each end arranged to throw light along the conveyor and across each gate, and outlets have been provided at intervals for plugging in trouble lights. From May 12 to September 1, 1930, one of these trains worked every night and experienced no trouble with its lighting system.

The full make-up of each concreting train in service on the line includes a locomotive and its tender in addition to the extra tender, cement car, mixer car, and bin cars above described.

LOADING DEPOTS

For the proper service of the concreting trains, loading depots are established at convenient yards or locations where sidings may be installed at proper spacing to permit the installation of a specially designed track hopper and feeder belt conveyor installed under the unloading track and feeding into the boot of the vertical bucket elevator with a swivel discharge chute at the top of the elevator through which the bin cars are loaded. These unloading and loading units have a capacity of 65 to 70 cubic yards of aggregate per hour, and are powered with a 20-horsepower water-cooled gasoline motor with a friction clutch and sprocket chain drive. The bin cars are loaded at the loading depot before the concreting train leaves for its day's or night's work.

These concreting trains, which have a capacity of 120 cubic yards of concrete, were designed for six hours actual working time as the maximum average to be expected either day or night on such a busy railroad. At times, the density of traffic has shortened the working time of the concreting trains so much that it has been found necessary to use the two trains on one track to keep up to the construction schedule.

The mixing and placing of concrete in the foundations of the catenary structures east of New Brunswick has been materially reduced in cost and has been performed far more efficiently and with less interference with traffic by the use of the concreting trains, which have been described above, than has been possible under preceding methods.

Progress on Manhattan's New Freight Terminal

THE pouring of 328 massive concrete piers which will carry down to bedrock the 600,000-ton weight of Manhattan's first Union Inland Freight Terminal is progressing rapidly. In excavating the site for the Terminal, which will cover the entire block between Fifteenth and Sixteenth Streets, from Eighth to Ninth Avenues, a pit has been created nearly as large as those for the Grand Central and Pennsylvania Terminals. The Terminal structure, which will be 800 x 200 feet and 15 stories high, will contain 38,000,000 cubic feet.

About 90 per cent of the excavation is now complete and 104 of the 328 reinforced concrete piers have been poured. Averaging nearly 8 feet square they extend down 25 to 80 feet blow the street level, depending on the distance to bedrock. Numerous sumps have been sunk and the ten huge pumps are operated day and night to keep the bottom of the excavation dry. Four steam shovels, seven cranes, three derricks and several hundred workmen are employed without interruption 25 feet below the ground-water level.

This freight terminal is being constructed by the Port of New York Authority, with Abbott, Merkt & Co., New York, as the Architects-Engineers for the project.

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News of Consultants
in the
Civil Engineering Field

The Consulting Engineer

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When Old Ideas Are New—
A Method for Laying
Bituminous Macadam Pavement
Devised by Hoosier Consultant

Office of
W. Robert Paige,
Terre Haute, Ind.

LAST year W. ROBERT PAIGE, Terre Haute, Ind., prepared plans and specifications and constructed nine blocks of bituminous macadam pavement in the City of Marshall, Ill. While some of the features of construction were original with Mr. Paige, no doubt the same methods may have been used in other works.

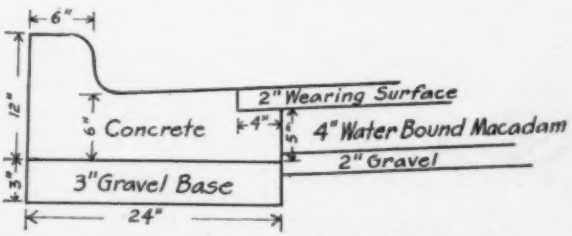
The originality of any method or methods are subject to question. For example, sometime ago an engineer in Wisconsin submitted an article to one of the engineering papers, in which he claimed to have originated a method of subdividing land into city lots, using a semi-circular street connecting two parallel streets at the end and using radial lines for the lot divisions. Mr. Paige had used the same idea several years prior, and an engineer much older than he came forward with proof that he had used the same idea along about 1890.

Whether these ideas are original or not does not matter; the results were very satisfactory. The soil encountered in the work, a heavy clay, was excavated to a depth of 8 inches below the top of the finished pavement. On the subgrades, without rolling, was spread a layer of creek gravel of good quality, to a depth of 3 inches. This was thoroughly harrowed, the teeth scratching the clay subsoil. A 10-ton roller was used to compact to 2 inches. A 4-inch compacted thickness of water-bound macadam was placed on the gravel, and a 2-inch wearing surface penetrated with hot asphalt. A seal coat completed the pavement. The use of the gravel serves as a subdrain and a filler for the base of the water-bound macadam, and at the same time reduced the cost.

Another feature was in the curb and gutter built along the sides of the pavement. This was the standard form used by the city, a 6-inch curb and an 18-inch gutter, with the exception that in the upper outside edge of the gutter, a groove 2 x 4 inches was constructed by placing a 2 x 4-inch timber along the edge, removing it after the concrete was sufficiently set up.

This groove was filled with the penetrated asphalt wearing surface and provides a better sealed joint between the gutter and the pavement.

In this type of construction, much rolling is required and it is not always possible to prevent chipping the edge of the gutter. The edge next to the roller being below the wearing surface, any breakage can be filled with macadam, and the wearing surface finished level with the undisturbed inside edge of the groove.



A Cross Section of the Curb and Gutter and the Bituminous Macadam Pavement

The Consulting Engineer

A Section of

Contractors and Engineers Monthly

470 Fourth Avenue, New York

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A New Flat Slab Concrete Floor Construction

ACCORDING to a recent report, WALTER H. WHEELER, 1000 Metropolitan Life Bldg., Minneapolis, Minn., has introduced to the architectural and engineering profession a new "Smooth Ceilings" system of flat slab floor construction for use in either steel or reinforced concrete buildings. Mr. Wheeler states that this design eliminates the concrete capital and drop panel by using a steel head at the column which is enclosed in the slab. It also eliminates the steel girders and beams in the interior of steel frame buildings, replacing them with light steel ties between columns and carries the load directly to the columns on the steel column heads. Mr. Wheeler has been designing flat slab construction for 23 years.

New Sewage Treatment and Disposal Program for New York City

GROUND was broken on July 7 for the Wards Island unit, one of the thirty-three units in the $300,000,000 program for sewage treatment and disposal in New York City. This first unit will cost approximately $30,000,000 and will consist of a pumping and air blower plant, heating plant, plant for housing storage tanks, new sea wall, two large rock tunnels leading from Manhattan and the Bronx and intercepting sewers leading into these tunnels. The sewage treatment and disposal program is being worked out by the Department of Sanitation, City of New York.

The Wards Island sewage treatment plant will have a capacity for an average daily sewage flow of 180,000,000 gallons and will be able to dispose of twice this flow at times of storm. The plant will be of the most modern type for high grade sewage treatment and will employ the activated sludge process. This process produces a thoroughly satisfactory effluent and operates with complete freedom from odors and flies. The plant occupies a 50-acre site and about 30 acres of this will be completely covered by the tanks, buildings and other portions of the works.

Outward attractiveness has been a great factor in the designing of the buildings and in the general layout and they have been designed for utility and beauty. Fuel oil will be used for heating the building to eliminate, as far as possible, smoke nuisance. The entire works will be electrically operated. Over 200 electric motors varying in size from 2,100 horsepower to ½ horsepower will drive the various machinery. It is expected that the Wards Island sewage treatment plant will take about four years in which to be completed.

The principal materials and quantities required for construction are in approximate figures: 150,000 cubic yards of concrete, 230,000 barrels of portland cement, 18,000,000 pounds of steel reinforcement, 5,000 tons of cast iron pipe, 600,000 cubic yards of earth excavation and 100,000 cubic yards of rock excavation. The total estimated cost of the Wards Island sewage treatment works is about $16,000,000 and the additional cost of intercepting sewers, tunnels and appurtenances to deliver sewage to the works is about $14,000,000. FULLER & MCCLINTOCK, 170 Broadway, New York City are the designing engineers.

"The Ideals of Engineering Architecture" Written by Engineer

A NEW engineering book, "The Ideals of Engineering Architecture" prepared by CHARLES EVAN FOWLER, has recently been published by the Gillette Publishing Co., Chicago, Ill. This book contains more than 300 pages, covering all phases of engineering design with over 300 instructive and artistic pictures. Mr. Fowler is a member of the American Society of Civil Engineers, the Engineering Institute of Canada, the Society of Terminal Engineers and a fellow of the American Numismatic Society.

At present Mr. Fowler is engaged in the preparation of plans for a ship channel 50 miles long, the design of a power plant, a steam electric power plant and a $3,000,000 toll bridge. His office is located at 25 Church Street, New York City.

Consulting Briefs

McNamara & Nosky, 517½ Dewey St., North Platte, Nebr., are preparing plans for a drainage project in Dawson County and a paving project for Kimball, Nebr. This company is also supervising the construction of an athletic field and track for North Platte, a swimming pool at Ogallala, paving at Ogallala and a drainage project near Cozad, Nebr.

Kastenhuber & Anderson, Easton, Md., are at present working on a report on the sewage disposal improvements for the town of Easton, Md. Under their supervision street paving, storm drain, curb and gutter construction is going on for the town of Easton, Md., and a 700-foot concrete sea wall at the estate of P. A. Ross, Talbot County, Md., is being constructed. W. H. Elliott has been added to the staff to succeed E. L. Mustard who recently resigned. Mr. Elliott will have charge of the architectural work, including design and supervision, which this firm combines with its general engineering practice.

Mead & Seastone, Madison, Wis., are preparing plans and specifications for a water softening plant for Quincy, Ill.

Arthur L. Webster, 130 E. Liberty Drive, Wheaton, Ill., recently prepared plans for the 5,500-foot sewer extension to Du Page County farm, the contract for which has already been awarded to C. J. Ryan, Elmhurst, Ill., for $14,745.

Frederick A. Phelps, 21 Fulton St., Newark, N. J., reports that he has recently added to his staff Alvah H. Farrow and Fred C. Boldry. They are now working on plans for a new plant for the New Jersey Toilet & Towel Supply Co., and under their supervision an office building is being constructed for the Eagle Fire Insurance Co.

The Hollister Engineering Co., 105 Bankers Life Bldg., Lincoln, Nebr., report that they are at present working on plans for an electric lighting system for Firth, and for improvements for the electric plant at David City, Nebraska.

H. A. Marshall, Topeka, Kansas, has been appointed by the Mayor of Topeka as a member of a traffic committee to study traffic problems and make specific recommendations to the City Commission for solving the problems. Ordinances and reports recommended by this committee have been passed by the Commission and are in accordance with the recommendations of the National Conference on Street and Highway Safety. Mr. Marshall is an Associate Member of the American Society of Civil Engineers, Past President of the Topeka Engineers Club, and a representative to the American Engineering Council at Washington, D. C.

J. Paul Blundon, of Charleston and Keyser, West Va., has announced the opening of a new office in the Security Banking & Trust Bldg., Charleston, West Va., with E. B. Snider in charge. At present they have recently completed plans for a swimming pool at Camp Conley, West Va. Under Mr. Blundon's supervision water supply systems are being installed at Frostburg, Maryland and Pennsboro, West Va.

Malcolm Pirnie, 25 West 43rd Street, New York City, reports that at present he is at work on a rate case for the Consolidated Water Co. of Utica, in association with Robert A. Horton of Albany and Metcalf & Eddy of Boston. He is also working on a 3,000,000-gallon concrete reservoir for the City of Washington, D. C.

Robinson & Steinman, 117 Liberty St., New York City, are in charge of design and construction of the new bridge at Bucksport, Maine. This new highway bridge which will extend across the east channel of the Penobscot River will be known as the Verona Island Bridge. The contract for its construction was recently awarded.

Barker & Wheeler, Engineers, 36 State Street, Albany, N. Y., and 11 Park Place, New York City, announce that they have added to their staff **C. Robb DeGraff** of Amsterdam as Resident Engineer of construction work now going on in Fonda. Among the projects under the supervision of this firm are water supply systems for Indian Lake, Bedford Hills, Inlet and Yorktown Heights, N. Y., a covered reinforced concrete distribution reservoir for the City of Elmira, N. Y., a storage reservoir with an earth dam, reinforced concrete corewall and modified morning glory spillway at Fonda, N. Y., and an intercepting sewer system for the City of Chester, Pa.

R. C. Wheeler

Chas. A. Haskins, Finance Bldg., Kansas City, Mo., has recently added to his staff Walter V. Thomas, former City Engineer of Leavenworth, Kansas. This company is now working on plans for a sewer and disposal plant at Boise City, Okla., storm sewers at Great Bend, Kansas, and sewers and disposal plant at Leoti, Kansas, and electric light and power rate revisions for Norton, Kansas. Under their supervision a dam, reservoir, flowline and pumping stations are being constructed at Augusta, Kansas, paving and street improvements are being carried on at Syracuse and Norton, Kansas, and water works improvements at Smith Center, Kansas. R. O. Ruble, a member of the staff, recently prepared a paper, "Designing Extensions to a Distribution System" for the Ninth Annual Three-Day School of the Kansas State Board of Health.

L. J. Jordan, 1340 Harding Place, Charlotte, N. C., is working on plans for a sewer system for Columbus, N. C.

Myron H. West, President, American Park Builders, 201 E. Ontario St., Chicago, Ill., reports that he is now working on an article for the National Real Estate Journal, the title of which is "Lincolnshire—A Successful Recreational Community," and an article for the Park & Cemetery Magazine, entitled "The Modern Burial Park." Under his supervision the Barr Cherry Hill golf course and club house are being constructed in Joliet, Ill., for Senator R. J. Barr.

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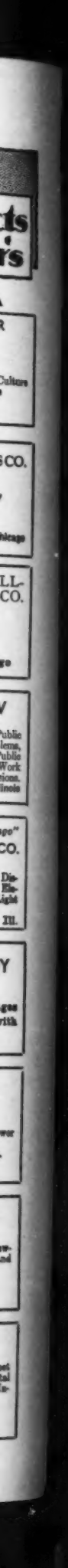


The Editor Comments —

Handling the Job in Hot Weather

While the middle west was in the grip of the heat wave that caused so much suffering I was traveling across Michigan and Wisconsin. The paving industry suffered exceedingly from the hot spell, particularly in Wisconsin where it had been preceded immediately by two weeks of wet weather that had slowed things up badly. The heat made it impossible to maintain any speed in pouring the slab as it was physically impossible for any man to continue at his usual pace for any length of time. It was interesting to note the manner in which the various contractors took care of their men during the hot weather to prevent injury or death. There were, in spite of this, several cases of heat stroke and at least one death.

When the heat began to bother his men one contractor immediately lengthened the noon lunch period from one-half hour, which is customary, to two hours. Another made the lunch hour one and a half hours and gave the men rest periods from nine-thirty to ten and from three-thiry to four. Still another contractor who had temporarily lost the services of several men from the heat and one of whom died gave the men a fifteen-minute rest period out of every hour. The first mentioned who gave a longer lunch period said that the change in the men was apparent immediately. They were fresher and showed their appreciation of the opportunity to regain their strength. And, not only the men, but the trucks which were hauling over long distances with rough grades had less tire trouble when they had a chance to cool off during the time the men were resting. Men and machines appreciate consideration.

Cement Car Loading

We have mentioned in these pages in articles and Comments the increasing interest in and the rapidly wider-spread use of bulk cement. It has become axiomatic. There has been one complaint that has been registered by Superintendents on a number of jobs regarding the cooperation of cement manufacturers that may reflect on the use of this method of handling cement if it is not corrected.

Box cars with tight roofs are loaded about one-half the height of the car with the cement and the doors boarded and carefully sealed with paper. In theory at least this is the manner in which the cars are loaded. Fully half the cost, as far as the contractor is concerned, in unloading the car is in clearing the doors so that the men can work at both ends. Several contractors have reported that the cement was loaded so high in the center of the car that the actual cost of unloading was greatly increased because only two men could work on the car until it was fully two-thirds unloaded.

If our understanding of the method of loading bulk cement into the cars is correct there is no reason why the cement cannot be spouted so that it will be piled higher at the ends than at the middle. There will naturally be a tendency for the cement to reach a level as it is much like a fluid in its properties until it is packed. With higher loading at the ends there will certainly be little chance for the complaint that has arisen of too high loading in the center which robs the contractor of much of the price advantage in the use of the bulk cement.

Self-Starters or Idling Heavy Equipment?

During my trips this summer I have noted perhaps more than usual the large number of pieces of heavy construction equipment, such as tractors, cranes and shovels, that were left idling during the noon hour or for long periods when their services would not be needed. Why? Because the operators were too lazy to crank them again and as one contractor said, "With gas at eight cents a gallon, what is the use of stopping them?" Every piece of equipment deteriorates when not in use to some extent, but this applies to long periods of storage and weathering. It wears and deteriorates much more rapidly when it is running continuously as anyone who operates an automobile will testify. Run your car for a few miles and stop the engine and see how well it runs, but run it continuously for ten hours and see how hot it becomes and how fast the oil needs replacing.

A few pieces of construction equipment are now equipped with self-starters and some contractors have remarked that they were influenced to no small extent in the purchase of that particular machine because it was so equipped. Construction equipment is today at the same stage of development as the automobile was ten or fifteen years ago when we heard of broken wrists by the hundred from cranking obstinate "Lizzies." I heard on one job a comment that is rather pertinent on this topic. It was time to move a string of gondola cars so that the crane could unload another car. The string was long and heavy and to move them by hand was a real job. The contractor had provided a 30-horsepower tractor to move the cars as needed but it was not kept idling all the time. One of the car men said to the other, "Oh, let's use the pinch bar. He won't have the tractor started for fifteen minutes and the crane can't wait." With a self-starter that delay would have been entirely eliminated. When are we going to modernize construction equipment?

New England Next

After three weeks in the South and seven in the Middle West with short periods of office work between, I am now off for a short trip in New England, to see what new methods are developing there.

Theodore Reed Kendall

The Power Shovel at Work Clearing the Stream

Saving the Greens at the Twin City Golf Club

THE excessively hot spell toward the end of June spelled the end of putting greens if the artificial watering systems in the middle west did not function one hundred per cent. The Twin City Golf Club of Benton Harbor, Mich., has for many years relied on a small creek that meanders through the flats below the course, to bring in enough water from the lake to permit pumping through the underground water system by a pump located close to the course. The course of the creek had slowly filled up, the level of Lake Michigan has lowered considerably during the last few years, and the hard pumping during the hot spell had just about dried up the creek. The golf club faced the danger of losing its greens if something was not done to clear the bed of the stream and get water back through the creek.

Contractors with heavy equipment were consulted and asked to bid on the work. None of them were willing to attempt the work for less than $1,000 because of the heavy planking that would be necessary to get the excavators out over the 18-inch mat of roots and grass that overlays the muck. Finally a contractor was found who had lighter equipment and who was willing to attempt the work for less than $500. He did the job in three and a half days and was well pleased with his profit.

The work consisted in bringing in a Michigan power shovel with a ground pressure of only 5.5 pounds per square inch of tread and running it along the ditch, using the regular shovel boom so that the operator could see just where he was working. The ditch was cut to a width of 5 feet and a depth of 5 feet, using a ⅜-yard Williams clamshell bucket. The material as taken out looked like soup but when dried on the flats was seen to contain sand and muck. The machine was worked about 6 feet from the bank of the creek and cast an equal distance on the far side. The far side crawlers were planked with 3-inch planks to prevent cutting in as the load was transferred to that side in casting. At one point the shovel started to sink into the muck on the front end and was settling at the rate of about ½ inch an hour. A block and tackle and a Fordson tractor quickly pulled the machine back onto more stable material. The length of ditch cleaned was about 3,000 feet and was done neatly in three and a half days.

Curing Concrete Pavements

IN these days the construction of a concrete pavement moves ahead so rapidly, and so much more is put down in a day or week than was the case just a short time ago, that the problem of securing adequate curing of the concrete has taken on new aspects. Although most highway engineers still think that the most favorable curing condition exists when the slab is kept damp during the curing period by means of a wet covering of earth, sand, straw or burlap, sometimes practical difficulties arise that make other methods appear attractive. Difficulty in providing an adequate water supply for keeping some two miles of cover properly wet; difficulty in securing thorough compliance with the specifications so far behind the crew; and the lack of opportunity to inspect the finished work, are some of the factors that have opened the way to the use of other methods.

For two years a special committtee of the Highway Research Board, R. W. Crum, Director, Washington, D. C., has been studying curing and gathering facts concerning the more extensively used methods. A review of the available data is presented in the progress report of this committee in the Tenth Annual Proceedings of the Board. Although research studies have not yet progressed to a point where definite standards of comparison for different curing methods can be set up, considerable information is available on strength, surface condition and volume change, all of which give some indication of curing qualities.

Surface applications of calcium chloride in regions where the air temperature and humidity are such that salt will readily dissolve have been found to produce concrete 90 per cent or more as strong as concrete cured with a wet cover, with no greater changes in volume. This method has not been found to be a primary cause of surface scaling in appreciable amounts. Extensive surveys show that the percentage of total area scaled under either wet earth or calcium chloride surface curing is very small. If conditions conducive to scaling are present the scale is likely to occur under either method but will probably be somewhat more extensive on the calcium chloride-cured work.

Concrete cured with bituminous coatings, in general, showed strength 90 per cent or more of that of wet cured concrete. Volume changes as evidenced by temperature ranges, direct measurement and crack surveys are greater, indicating that more frequent shrinkage cracks are to be expected unless prevented by proper joint spacing. Bituminous-cured pavements in regions where fine sand subgrades are a distinctive feature have been examined and showed uncracked slab lengths as great or greater than those on pavements cured with wet earth. Coating the bituminous-covered surface as soon as possible with some light colored material such as whitewash appears to decrease the volume changes.

Conflicting evidence regarding the strength of concrete cured with calcium chloride admixture, or surface application of sodium silicate makes the acquisition of further information concerning the factors that influence the efficiency of these methods as regards strength necessary before definite recommendations can be made. The volume changes occurring with the use of sodium silicate as a curing agent were not great enough to make this factor a matter of importance in deciding upon its use.

Mixers in Tandem Speed Up Paving

TANDEM concrete mixers made their first appearance in Minnesota this year and are now in use on several trunk highway paving projects. Their use is expected to speed up paving construction about 50 per cent. The standard highway paving mixer makes 30 cubic feet of concrete in one batch. The Minnesota State Highway Department specifications require 60 seconds mixing time, and with the time required to get the material into the drum and the mixed concrete out, 75 seconds are required per batch when the mixer is working full speed. This makes 48 batches per hour and each batch makes 2.44 linear feet of pavement, 20 feet wide, or 117.1 linear feet per hour.

In the tandem plan two standard mixers are used together. The cement, sand, gravel and water are mixed 30 seconds in the first mixer, then transferred to the second machine and mixed 30 seconds more. In the meantime a second batch is started in the first mixer. With this plan it is possible to turn out 72 batches per hour, increasing the speed of laying pavement to 176 linear feet per hour. The plan requires a proportionate increase in the number of men and trucks employed.

Floating Revolving Crane Moves Itself 1½ Miles in 1½ Hours

THERE are times when the usual methods of transportation are too slow for most of us. That is the reason for the increasing popularity of the air liners which speed from all of our metropolitan centers across the country from east to west and back and north and south. Water transportation, except the variety provided by Gar Wood, is usually considered the slowest. On construction work with floating equipment this is particularly true as the great ponderous cranes, dredges and barges that are used cannot be moved with any great speed. Even the peppy little tow boats that always bring a word of admiration from the laymen are none too speedy, but they are powerful.

On the Merritt-Chapman & Scott Corp. contract for the construction of the bridges for the Mt. Vernon Memorial Highway from the Arlington Memorial Bridge at Washington to Washington's home at Mt. Vernon along the Virginia shore of the Potomac, practically all floating equipment was used. There were floating pile drivers, barges, dredges, a complete floating concrete plant, cranes and a lone tow boat that was wanted in more than one place at the same time. A Wiley-Whirley mounted on a barge which was being used to unload gravel at the lower end of the work had completed its job and was needed about 1½ miles upstream for some other work. A telephone call was put in for the tug which was at the Fourteenth Street bridge fully 12 miles upriver. The barge operator thought that he might as well work the barge out into the channel and save time. He cast the bucket first to one side and then to the other pulling the barge along slowly but keeping it in constant motion. By skillful use of the currents and the casting of the bucket as far as possible he had that barge moved the entire distance of 1½ miles in 1½ hours and was tied up to the new location and working when the tug put in an appearance. After that there was no time wasted putting in a call for the tug when it was to be moved comparatively short distances, out went the bucket like a fisherman casting a fly, a grab, a steady even pull and the barge moved ahead under its own power pulling instead of propelling.

The operator of this piece of equipment has become so proficient in casting the bucket that he can hit a stake set at almost any angle and at any distance within the limits of the cables by simply "casting" with the heavy bucket instead of the light-weight fly of the fisherman.

Building a Highway Across a Four-Acre Peat Bog

FOR two and one-half months the engineers of the New Jersey State Highway Department and Geo. M. Brewster & Son, Inc., of Bogota, N. J., contractor for one of the main approach highways in New Jersey which will carry the very heavy traffic to the new George Washington Bridge, wrestled with a 4-acre peat bog that merited the time-honored epithet of "bottomless." The section where the trouble occurred is not far from the Northern Branch of the Erie Railroad where an overpass is to be built for the highway to cross the railroad.

Tons of rock and earth were poured into the bog only to disappear overnight with no impression on the stability of the fill for the highway. As mentioned in an editorial some months ago a 5-ton boulder cast onto the peat bog one afternoon had completely vanished by morning. It became imperative to dry up and dig out the bog in some manner so as to make a stable fill possible as it was delaying the progress of construction and that was not too far in advance of the opening of the bridge late this year. Moretrench header pipe was laid around the edges of the bog and Moretrench well points spaced 3 feet apart were jetted in to a depth of 25 feet and then connected to the header pipe. Five Moretrench combination pumps were then connected to the header and started up. At first there was a heavy flow of water estimated to run about 1,000 gallons a minute per pump, but after a day or so this flow decreased and at times was less than 100 gallons per minute. The pumps maintained a continuous heavy vacuum on the bog with the result that it dried up completely and there was no difficulty in digging it out, even during heavy rains.

The bog occupied a depression in the rock, the width of the depression varying from 90 to 120 feet and the depth to rock or to hard material ran from 20 to 30 feet. After the soft material was dried up, it was dug out with two cranes working from one end. As fast as the cut was dug out it was refilled with broken rock on which the excavation was trucked out and over which the cranes moved forward.

The accompanying photographs show a crane starting excavation, another with the crane disappearing from view but not sinking in the bog, simply digging its way in, and the center photograph showing a pit 21 feet deep in dry material which once was part of the bottomless peat bog.

DRY EXCAVATION IN A BOG

1. The Lorain 75B of Geo. W. Brewster & Son, Inc., digging dry material from the bog after the Moretrench well points had lowered the ground water level sufficiently for the material to dry out. 2. Twenty-one feet of dry excavation in the "bottomless peat bog." 3. Cranes working in a section of the bog after it was drained and showing the New Jersey tower of the George Washington Bridge in the background.

How the Other Fellow Did It

Construction Briefs

Handling of Steel Road Forms

103. Steel road forms are sturdy pieces of equipment and will stand a lot of rough handling, but special care in handling them will make it possible to use the forms for double the number of jobs. On a New Jersey job, it was required that the forms, which were pulled 24 hours after pouring, be set up on the edge of the 10-foot slab on the pins. This has several distinct advantages. First, the forms are off the roadway, where there is no danger of steel-wheeled equipment or tractors crimping them, nor of pneumatic tires being slashed by hitting the forms. Second, there is a psychological effect upon the laborer in setting up a form neatly on the slab where it can be so readily seen. He will have a tendency of his own initiative to knock off any concrete which may be adhering to it and will see that the pins are straight. Third, the superintendent or the state inspector can quickly note any forms which are not in good condition and have them discarded. 21.1.64

A Good Sand and Gravel Plant Set-Up

104. A first class crushing and screening plant was set up by a contractor in western Massachusetts to furnish washed aggregate for his nearby concrete paving jobs. Test pits showed an abundance of gravel and a pond 100 feet away furnished sufficient water for washing. Because of the nearness of the gravel pit to the crusher set-up, one steam shovel and one 5-ton truck were sufficient to supply the plant, dumping the gravel in a bench, the top of which was level with the floor of the gravel pit. The top of the bin was grated with old rails to keep out stones larger than the crusher could handle.

The bin had a sliding feeder which was geared up to work back and forth across an opening at the bottom. The speed of the feeder was regulated by a man at the crusher. This fed the material into a rotary scalper screen which dropped the sand and small stones to a pit below the crusher. Larger material retained on the scalper screen fell into the crusher, passed through it and landed in the same pit. A bucket elevator conveyed the crushed material to the main grading screen. As these buckets dumped, the material was met with a 4-inch jet of water which washed all fine material from the stone. This fine material passed through the ¼-inch openings at the upper end of the screen but did not fall immediately into the sand bin which was located directly below. Instead this portion of the screen was jacketed, the jacket emptying into a chute through which the sand passed to a sand washing rig from which it was shunted back to the sand bin clear and ready for use. The lower end of the main screen had 2¾-inch circular openings.

Stone passing through these fell into the stone bin while the tailings, which were retained on it, passed through a chute to a belt conveyor which carried them back, emptied into the scalper screen and thence through the crusher again. The space directly below the path of the elevating bucket was boarded and the spill from the bucket was collected there which considerably lessened the amount of work necessary to keep the ground clear below. At the bottom of both the sand and the stone bins were weighing batchers. These were mounted high enough to permit the passage of large trucks beneath. Two electric motors supplied the power to operate the plant, one a 50-horsepower motor running the crusher, scalping screen and feeder and a 30-horsepower motor running the elevator, main grading screen, washer and tailings conveyor. 20.3.94

Settling Fills by Jetting

105. New fills are about as satisfactory as foundations for hard-surfaced pavements as a pile of rubber as they do not consolidate rapidly. The scheme used by some of the southwestern states is to jet the fills and then allow three weeks for them to dry out and settle. On a Federal Aid project in Alabama, a 50,000-cubic yard fill was jetted by a foreman with two helpers using a pump capable of giving 60 pounds pressure, a line of pipe to the fill and about 50 feet of ordinary hose with 8 feet of ½-inch pipe for a nozzle. The hose was sunk to a depth of 3 feet in all directions. Where the fill had consolidated at the top, the crust was broken with a pick and only a minute or two was necessary for the jet to eat its way to the bottom of the fill. The cost of jetting was about 3 cents per cubic yard. 20.3.77

Fitting Ready-Mixed Concrete to a Road Job

106. Out in New Jersey a paving contractor bid on a job 4½ miles long but which only involved a strip of concrete 3 feet wide on each side of the road to widen an existing 18-foot bituminous concrete pavement which was to be resurfaced. To run a 27-E paver along a job of this kind would be a waste of money or even to use a small building mixer would involve the difficulties of handling small quantities of aggregate over a long operating base. The contractor solved the problem by arranging for delivery of ready-mixed concrete from a plant 9 miles from one end of the 4½-mile job. The fleet included six to nine agitator trucks, each carrying 3-yard batches of 1:3:5 concrete which had been mixed 3 minutes at the plant. The run to the job took about one-half hour through streets filled with heavy local traffic. At the job the truck ran alongside the strip on one side of the road, delivering the concrete through an extension coal chute to the strip. The control of the flow was handled by one man who operated the delivery gate and signalled to the driver to raise the dumping mechanism of the truck to speed up the flow of the concrete to the chute. A gang of eight men effectively handled the placing of the concrete; four men shoveled the concrete and smoothed it out, one tamped the concrete with the back of a shovel, another swept any concrete which might have been spilled on the roadway into the widening strip, one handled the chute, one the gate on the truck and the foreman made himself generally useful. With a fleet of 6 trucks and the crew mentioned above 2 miles of widening strip was laid per day. 20.5.66

Handling Concrete for Side Girders and Hand Rails on Concrete Bridges

107. The usual method of pouring the concrete encasing on side girders and hand rails on viaducts and bridges, is to erect a runway for the concrete buggies at the same elevation as the top of the form. On a New England job recently, the contractor saved the expense of the high runways by mounting the steel hopper which is generally used for filling the buggies on a 3-ton truck. He then ran the hopper under the chute of the mast plant, filled it and drove the truck out over the panel to be poured. As the gate on the hopper was set at the side, it was possible to chute the concrete directly into the side forms with a minimum of delay. This completely eliminated the high runways which were expensive to construct and saved in labor as no men were needed to push the buggies. 21.3.56

Who's Who in Construction

A Series of Reports from Active Contractors

BUS. VOLUME—ANNUAL VOLUME OF CONTRACTS
A—Over $5,000,000
B—Between $1,000,000 and $5,000,000
C—Between $250,000 and $1,000,000
D—Between $250,000 and $500,000
E—Under $250,000

E. D. Ward Co., Worcester, Mass., 82 Foster Street. Organized: July, 1918. Bus. vol. C. This company was founded by Edward D. Ward under individual ownership about 1900 and was incorporated in 1918, specializing in concrete bridges, dams and heavy mill construction. Officers: B. LeRoy Knowles, President; Forest Atwood, Vice President; Frank Jones, Treasurer. Major contracts: 1927-28, home for the aged, Concord, N. H.; 1928-29, bridge work for the Central Vermont Railway Co.; 1929, Independent Lock Co., Fitchburg, Mass.; 1930, Bancroft Garage, Worcester, Mass., Tatnuck Congregational Church, Worcester, Mass., and Second Advent Christian Church, Worcester, Mass. Member: A. G. C., Worcester Chamber of Commerce and Employers Assn. of Central Massachusetts.

B. L. Knowles

Larson-Danielson Construction Co., La Porte, Ind., 302 Tyler St. Organized: 1908: Bus. vol. D. This company was incorporated in 1908 by Charles O. Larson, Emil Danielson and Frank A. Larson. Following the death of Charles O. Larson in 1919, Marvin A. Danielson and Raymond F. Larson, sons of Emil Danielson and Frank A. Larson respectively, were taken into the firm. Frank A. Larson died in March, 1930, so of the original incorporators only Emil Danielson remains in the firm. Officers: Emil Danielson, President; Marvin A. Danielson, Vice President; Raymond F. Larson, Secretary and Treasurer. Major contracts: 1928, First M. E. Church, La Porte, Ind., Metal Door & Trim Co., La Porte, Ind., Bastian-Morley Co., La Porte, Ind.; 1929, Montgomery-Ward Bldg., La Porte, Ind., Water Purification Plant, La Porte, Inc.; 1930, Civic Auditorium and Gymnasium, La Porte, Ind., Herald-Argus Bldg., La Porte, Ind. Member: Associated Building Contractors of Indiana and United States Chamber of Commerce.

Fred Haddad, Cleveland, Ohio, 3032 West Boulevard. Organized: 1924: Bus. vol. E. Mr. Haddad is the sole owner of this organization. From 1917 to 1924, he was Secretary with the Haddad-Mall Co., Cleveland. He has been the individual operator of the present organization since 1924. Major contracts: 1927, 5 miles of iron mains for the County of Cuyahoga, amounting to $128,000, and 3 miles of iron mains and 3 miles of sewers for the Village of Beachwood, amounting to $93,000; 1928, 2 miles of high service water main for the County of Cuyahoga, amounting to $34,000 and 2 miles of cast iron mains for the Village of Middleburg Heights amounting to $28,000; 1930, 3 miles of water mains in the Village of Brookpark, Ohio, costing approximately $35,000; 1931, 11 miles of water supply main for County Commissioners in Hamilton County, Ohio, at a cost of approximately $92,000. This contract is now under way.

Peckham Road Corp., White Plains, N. Y., 47 Mamaroneck Ave. Organized: 1924. Bus. vol. C. This company was incorporated in 1924 and after having completed several major contracts in Connecticut and New Hampshire moved to White Plains in 1925. The company specializes in bituminous macadam, developments and private and estate work. Officers: William H. Peckham, President; Charles D. Story, Treasurer. Major contracts: 1928, contracts amounting to $90,000 in Somers; $100,000 in the village of Scarsdale; $200,000 in the town of Greenburgh; 1929, contracts amounting to $100,000 in Harrison and $150,000 in Scarsdale; 1930, contracts amounting to $100,000 in Greenburgh and $75,000 in the Fox Meadow Estate. Member: Local Chamber of Commerce and the Associated General Contractors of America.

Phillipoff Construction Co., Inc., Clearwater, Fla. Organized: 1929. This company was organized under its present name in 1929. Before that time it was under the sole proprietorship of John Phillipoff, who had been established in Clearwater for many years. Officers: John Phillipoff, President and Treasurer; Thomas Hamilton, Secretary. Major contracts: residences in Belleair and Clearwater, Fla., amounting to $538,673.52, $53,900.76 and $45,197.00; repair jobs amounting to approximately $25,000.

Cold Spring Construction Co., Inc., Akron, New York. 3 Jackson St. Organized: 1911. Bus. vol. C. The officers of this organization are Eugene P. Forrestel, President; V. C. Forrestel, Vice President. The major contracts for this company included state and private contracts. Among the state contracts are included: 1928, Village of Wayland streets; Wayland-Hornell Highway; Holland-Glenwood Highway; Lawton-Gowanda Bridge; 1929-30, Naples-Plattsburg Highway; East Randolph-Salamanca Highway; Wayland-Conesus Highway; East Aurora-Holland Highway; Pennsylvania Railway Co., grade crossing elimination at Protection, N. Y. Private contracts included: Ebsary Gypsum Plant floors; Beaver Products Buildings, Akron, N. Y. Member: New York State Highway Chapter, Associated General Contractors of America.

The Hawkins Construction Co., Newark, Ohio. 10 E. Church St. Organized: 1927. Bus. vol. C. This company was organized as a partnership in 1905 under the name of O. J. Hawkins & Son. In 1925, O. J. Hawkins' interest was purchased by Fred A. Hawkins and operated under the name of Hawkins Construction Co. It became incorporated in January, 1927, and has since operated under the same name of Hawkins Construction Co. Officers: Merrill R. Montgomery, President; E. Stanton Hilleary, Vice President; Fred R. Reese, Treasurer; Fred A. Hawkins, Secretary-General Manager. Major contracts: 1928, office building for the Ohio Power Co., I. O. O. F. Building, Elks Club, and B. & O. R. R. freight house in Newark, high school at Mt. Vernon, Ohio and a hospital for Denison University at Granville, Ohio; 1929, two high schools, a church and several industrial additions in Newark and two fraternity houses at Denison University; 1930, several buildings for the Ohio Power Company in Zanesville, Ohio, an office building in Canton, Ohio, a high school in Lancaster, Ohio, and a library for Ohio University at Athens, Ohio.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Rights Against Contracting Partners

Whether a cement company must look to the assets of a paving contracting firm on account of materials furnished, or was entitled to the more favorable status of a creditor of the members of the firm in their individual capacities, was the principal question decided by the Michigan Supreme Court in an opinion announced January 7, 1931, in the case of O'Connor v. Vander Veen, 234 N. W. 101. Holding that the cement company must pro rate with general creditors of the firm, the court said:

"If the material was ordered by one partner for the business of the partnership, and so used, the cement company had a right to look to the partnership relation at the time of furnishing the material. . . .

"The cement was furnished after the formation of the copartnership, and the evidence discloses facts from which the cement company was bound to notice that it was furnishing material to a copartnership."

Legal Evasions of Income and Profits Taxes

Uncle Sam isn't such a bad sport, after all, in the matter of income tax exactions, according to the decision handed down by the United States Circuit Court of Appeals, Eighth Circuit, in the case of Iowa Bridge Co. v. Commissioner of Internal Revenue, 39 Fed. 2d, 777.

"Duck my tax laws if you can—legally," is what our Uncle Samuel says.

The bridge company was a one-man corporation, owned by J. S. Carpenter. It had several county bridge contracts that were completed at a profit. The federal taxes on these profits were higher if they were earned by the corporation than if they were earned by an individual. Before the profits were earned the company assigned the contracts to Carpenter.

The Commissioner of Internal Revenue thought that this still left the corporation liable for taxes on the profits, and the United States Board of Tax Appeals said the Commissioner was right. But the Circuit Court of the Appeals, the second highest tribunal in the country, said that both were wrong. The following extracts from the opinion of the court are deserving of close study, for they deal in a broad and important sense with the right of a contractor to assign contracts, as well as with the right to dodge liability if it can be done in a nice sort of way:

"Unless expressly prohibited by statute, all ordinary business contracts, which are not necessarily personal in character, are assignable. Public contracts, in the absence of any statutory provision or rule of public policy restricting the right of assignment may be assigned. . . .

"There was nothing in the nature of these contracts which required the personal services of either of the contracting parties, and it appears from the stipulation that contracts of this character were frequently sublet. The contracts were therefore clearly assignable, and there remains to consider whether or not they were in fact assigned. . . .

"An assignment need not be in any particular form so long as it indicates the intention of the parties, and the assignment here in question not only indicates the intention of the parties, but all of the interested parties acquiesced therein and acted thereon. . . .

"The fact that by reason of the transfer of these contracts to Carpenter and their performance by him resulted in a lessening of the tax burden, which would have been imposed had the contracts been fully completed by the Iowa Bridge Co., is not material. Tax on the income resulting from the completion of the contracts was paid by Carpenter and there was nothing illegal in the transaction. In fact, it is held that even though the transaction is a device to avoid the burden of taxation, or to lessen that burden, it is not for that reason alone illegal."

A Written Contract May Be Modified by a Later Oral One, But—

Although a written construction contract cannot be contradicted by showing that it did not express the true agreement of the parties at the time the instrument was signed, unless it be claimed and proved that, through mutual mistake or through fraud of the other party, the writing does not state the true understanding, there is ordinarily nothing to prevent a written construction contract from being *modified* by a subsequent oral agreement.

That principle was recognized by the Pennsylvania Supreme Court in the case of W. T. Price, Inc., v. Robbins, 148 Atl. 849. But the court said that an owner failed to avoid liability on a contract for street and sidewalk improvements on a real estate subdivision, by claiming that while the work was in progress, and when he became financially unable to complete it, it was orally agreed between the parties that the contractor would complete the improvement and look to lot sale proceeds for payment.

The court held that this defense was bad for failing to show that the claimed oral agreement was intended to apply to work that had already been done.

Responsibility for Negligence of Borrowed Truck Drivers

One person was killed and two seriously injured through negligence of the driver of a truck that had been hired to a construction company. In the case of Bowan v. Gradison Construction Co., 32 S. W. 2d, 1014, disposed of by the Kentucky Court of Appeals December 19, 1930, question was raised as to whether it was the owner of the truck and general employer of the driver or the construction company that was liable for the accident. The court held that the construction company was liable.

The truck was owned by one Richards and driven by his son. Richards furnished his truck and the driver, oil, gasoline, and everything else necessary for its operation, and the construction company paid him $2.50 an hour for its use. Richards hired and paid this driver, and the construction company had no right under the contract to discharge him or to put upon this truck a driver of their selection, but they had the right to send the truck home and terminate this contract when they chose. The construction company directed the loading, unloading, and operation of this truck.

Construction Industry News

The Portland Cement Association, 33 West Grand Ave., Chicago, Ill., has formerly selected as its President the president of one of the portland cement manufacturing companies. During his term of office he has not only guided the work of the Association, but has also continued to operate his own company. The duties of the Association President are so heavy, however, that the industry felt it unfair to continue to impose this burden upon the president of any one of its member companies. The Board of Directors has accordingly elected as President, Edward J. Mehren, Vice President of the McGraw-Hill Publishing Co. Mr. Mehren was for ten years Editor of Engineering Record and Engineering News-Record. Later he became Vice President and Editorial Director of the McGraw-Hill Publishing Co. and recently has been in charge of the company's activities in the Middle West, with headquarters at Chicago. He will assume his new office on September 1.

Cleveland Tractor Co., Cleveland, Ohio, has announced that, following the recent death of C. D. Fleming, Vice President, his duties as Director of Domestic Sales have been assigned, in accordance with certain territorial divisions, to W. E. Miles, G. W. Pickering and H. E. Orr who have been given the positions of District Sales Managers. Mr. Miles has charge of all the territory from an imaginary line between Chicago to New Orleans eastward to the coast. Mr. Pickering handles all the territory from a line between the western boundary of North Dakota to the western boundary of Texas extending to the western boundary of the eastern territory. Mr. Orr has been assigned the territory on the Pacific Coast. Mr. Pickering, in addition to handling the Central District in the United States, is also in charge of Cletrac sales in the Dominion of Canada and Mr. Orr will continue as Advertising Manager, along with the sales work in the Western District.

Chain Belt Co., Milwaukee, Wis., has recently appointed the Vermont Road Equipment Co., Montpelier, Vt., and the Northwest Machinery Co., 710 Front St., Boise, Idaho, as distributors for its complete line of Rex mixers, pavers, pumps, central mixing plants and other construction equipment.

Gardner-Denver Co., Quincy, Ill., has announced the appointment of the Texas Contractors Supply Co., Waco, Texas, as its representative in north central Texas for rock drill products and portable compressors.

Ransome Concrete Machinery Co., Dunellen, N. J., has acquired a controlling interest in Transit Mixers, Inc., San Francisco, Calif., and will hereafter manufacture Transit mixers at its Dunellen plant. There will be no change in the position or policy of the Ransome Concrete Machinery Co. in the field now occupied by it, and the two companies will operate as separate units.

Sullivan Machinery Co., Chicago, Ill., has announced the removal of its New England Sales Office from 45 Milk Street to 100-102 Brookline Street, Boston, Mass. In connection with this new location, ample warehouse facilities will be provided for carrying Sullivan compressors, drill and spare parts for prompt service to New England. Edwin T. Hall is Manager of this office.

Little Giant Products, Inc., Peoria, Ill., has taken over the Lee Trailer & Body Corp., Plymouth, Ind. The manufacture of bodies and trailers will be continued at Plymouth but the plant operation will be directed from Peoria.

Distributors' Bulletin Board

The distributors of construction equipment listed below have made changes this month in their cards appearing in the Distributors' Directory on pages 115 *to* 141 *of this issue of* CONTRACTORS AND ENGINEERS MONTHLY:

Bublitz Machinery Co., Kansas City, Mo.
Ensminger & Co., Wilkes-Barre, Pa.
John C. Louis Co., Baltimore, Md.
E. A. Martin Machinery Co., Joplin, Springfield, Mo.
K. B. Noble Co., Hartford, Conn.
Martin J. O'Brien Co., Pittsburgh, Pa.
Ronstadt Hardware & Machinery Co., Tucson, Phoenix, Ariz.
Steel Products Corp., El Paso, Texas
Western Road Machinery Co., Portland, Ore.
J. D. Wilkins, Greensboro, N. C.
Willard Equipment, Ltd., Vancouver, British Columbia, Canada.
Wilson Machinery & Supply Co., Inc., Lexington, Ky.

Prizes for Missing Links

IN every plant, no matter how well organized, there are points where material piles up, unnecessary labor is used, machine operations are interrupted or where better transportation is needed. The Chain Belt Co. believes that this is the time to hunt out these missing links and is offering $500 in prizes to those who find them.

For the best descriptive article and rough sketch showing how chain and belt conveying or any other Chain Belt products, including construction machinery, can be applied to lower costs, this company offers a first prize of $200, a second prize of $100, a third prize of $50 and fifteen prizes of $10 each. No obligation is involved. All articles will be judged on merit and no proposed installation is too small or too large as long as it is an existing plant. Full details and contest rules may be secured from the Chain Belt Co., 1600 West Bruce St., Milwaukee, Wis., and all entries must be received at that office before 5 P. M. on September 21, 1931.

Clyde W. Wood, Contractor, Stockton, Calif., Applying Oil to a Roadway in Menlo Park, Calif., with a BLJ Distributor. This Machine Was Sold by Edward R. Bacon Co., San Francisco

A New Revolving Tractor Scraper

THE new RC Groundhog revolving tractor scraper, which is adaptable to a variety of working conditions, has recently been announced by Farm Tools, Inc., Dept. 74, Mansfield, Ohio. It is automatic or rope-controlled, operates with any make or type of tractor and is made in 4 and 5-foot sizes. This scraper, the manufacturers claim, can easily and quickly be changed from full-automatic operation to semi-automatic or rope control.

When in automatic position, the driver pulls the trip chain once to start loading and again to dump the load. The automatic position prevents overloading and stalling of the tractor by pulling the scraper out of the bite when loaded and raising it to carrying position. When used in semi-automatic position, the pull on the loading rope determines the depth of the cut and the amount of the load, allowing for fast or slow loading. As soon as the rope is released, the scraper automatically returns to carrying position. This feature is designed to speed up leveling and is also useful on cleaning-up jobs. Under either control there is no lifting or tugging on the part of the operator to get the scraper out of the bite.

The New RC Groundhog Revolving Tractor Scraper

The bowl of the scraper is made of boiler plate steel, double braced at each end and hot riveted to the angle iron frame. The cutting blade is tough and heavy. The loaded bowl slides on heavy half-soles which protect the scraper, and can be economically replaced. Trash can not interfere with the work of the scraper because of the clearance under the drawbar. The frame is so shaped that the bearings are very close to the end of the bowl, thus permitting the use of short trunnions which can not twist or spring the bowl ends. Large roller bowlstops minimize the wear on the fingers and reduce the power required to take the bowl out of the bite. The hitch and control work equally well on all tractors.

High Pressure Triplex Road Pump

THE pump which supplies water to the paver on a concrete road job is the heart of the job and must be reliable. A high-pressure triplex pumping unit consisting of a Domestic Model 56 pump equipped with a pressure control regulator, a suitable gasoline engine and a truck, has been announced by the Domestic Engine & Pump Co., Shippensburg, Pa. The sizes R-80 and R-125 meet in full the standards set in 1931 for portable pumping plants for concrete road construction in the United States.

The Domestic Model 56 triplex pump has abrasion-resisting cylinder liners, automatic lubrication, V-type herringbone gears, ball-bearing high speed shafts and stainless steel plunger rods. The pressure control regulator is made as an integral part of the pump and is of the water-recirculating type with a discharge line check valve. The regulator can be set to cut out the pump at any desired pressure from 100 pounds up to 550 pounds. As the engine simply idles at governor speed during the time the regulator has the pump cut out, considerable saving in fuel results.

The New Domestic Triplex Road Pump

Both road pump units are equipped with heavy duty, 4-cylinder 4½-inch bore by 5-inch stroke Waukesha gasoline engine power units equipped with radiator, V-belt driven fan, friction clutch, high tension magneto, air cleaner, self-lubricating governor and pressed steel housing with removable doors. The engine has a governed speed range from 1,200 to 1,500 rpm and develops over 40 horsepower at the lowest speed and 46 horsepower at the highest speed.

A double flexible coupling between the engine and pump takes care of any slight misalignment that may take place between these two units, so that no undue strain is put on either the bearings of the engine or on the pump shaft. The pump and engine are mounted on a spring type trailer with an all-steel frame supported at all four corners by semi-elliptic springs.

The R-80 unit has a guaranteed working pressure range from 80 gallons per minute at 550 pounds pressure to 100 gallons per minute at 440 pounds pressure. The R-125 unit is rated for 125 gallons per minute at 320 pounds working pressure.

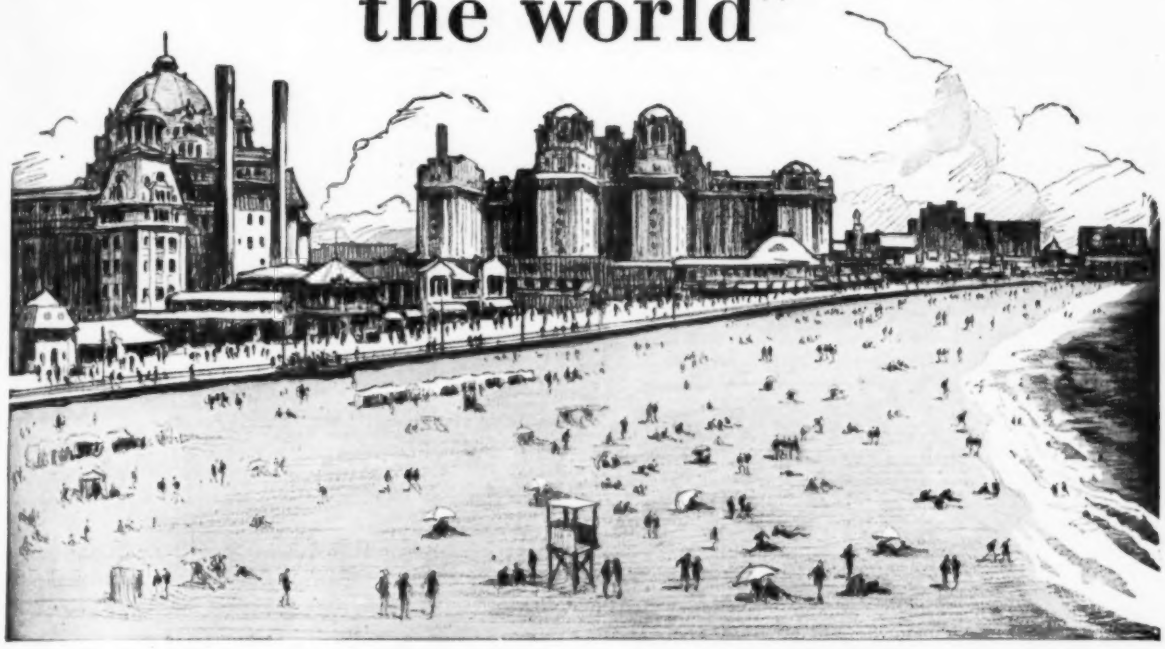
A Springless Joint Filler

A SPRINGLESS crack and joint filling pot has recently been developed by Littleford Bros., 485 East Pearl St., Cincinnati, Ohio. This No. 86-B pot has a rated capacity of 2½ gallons, with the flow of asphalt controlled by a weighted valve that can be easily opened or closed.

The valve seat at the bottom of the pot is made of cast iron and is heavy enough to be of material assistance in retaining heat to prevent the congealing of the bitumen at this point. The pot is constructed of sheet steel with strongly welded seams and can be thoroughly heated in a fire without injury to it. The top of the pot is the proper height to go under the draw-off cock of an asphalt heating kettle. The discharge nozzle can be changed to ½-inch, ⅝-inch or ¾-inch opening, as required.

The Littleford 86-B Crack and Joint Filler

At "the playground of the world"



"*We are using* deLavaud pipe *exclusively in all obtainable sizes*"

"About 7 years ago we started using cast iron pipe made by the deLavaud centrifugal process. This pipe proved so satisfactory that we are using it exclusively in all obtainable sizes." Thus writes Mr. L. Van Gilder, Engineer and Superintendent of the water department of Atlantic City, N.J.

Other cities in all parts of the country are aware of the efficiency and economy of deLavaud pipe. Springfield, Mass., Detroit, Michigan; Ft. Worth, Texas have purchased many miles of deLavaud Pipe for underground mains.

DeLavaud Pipe is produced by pouring molten iron into a rapidly revolving cylindrical mold. Centrifugal force holds the iron against the sides and drives out air bubbles and impurities with a force many times greater than gravity.

DeLavaud Pipe is light in weight, easy to handle and easy to cut and tap. At the same time, tests have proved that it is at least 25% stronger than good pit cast pipe. The deLavaud handbook gives detailed specifications. Write for free copy today.

United States Pipe and Foundry Co., Burlington, N.J.

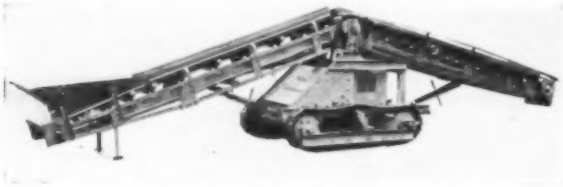
Sales Offices: New York, Philadelphia, Pittsburgh, Cleveland, Buffalo, Chicago, Dallas, Birmingham, Kansas City, Minneapolis, Seattle, San Francisco, Los Angeles

Our pipe bears the "Q-Check" trademark of The Cast Iron Pipe Research Association

A New Machine for Concrete Road Work

TO speed up concrete road construction, a new piece of equipment, known as the Conweigh tractor conveyor, has been developed by the Conveying Weigher Co., 90 West St., New York City, and is designed to simplify the carrying and spreading of mixed concrete.

This machine consists of an 18-inch belt conveyor mounted on a Conweigh tractor. This tractor can be turned in its own length, moved backward or forward as required and will propel itself up into a truck or railroad car and back out again when transported to the scene of the job. The power unit is a 15-horsepower 4-cylinder gasoline engine, water-cooled, with a large radiating surface and a gasoline capacity sufficient for one day's work. The belt conveyor is pivoted in the center of the tractor and in addition can be bent in the middle so that the receiving or lower end of the conveyor can be dropped down onto the ground to receive its load. The discharge end of the conveyor can be dropped down so that it will discharge within approximately 3 feet of the ground, as required in road work, or it can be raised up in a 30-foot conveyor to about 12 feet above the ground for use in pouring side walls of buildings, retaining walls or similar work. On the receiving end of the conveyor there is a wide hopper approximately 3 feet wide and 5 feet long, so designed that the mixer can discharge into it without having to be placed exactly central with the conveyor.



The New Conweigh Tractor Conveyor

There are skirtboards of the same compound of rubber as the conveyor extending the entire length of the conveyor to avoid spillage.

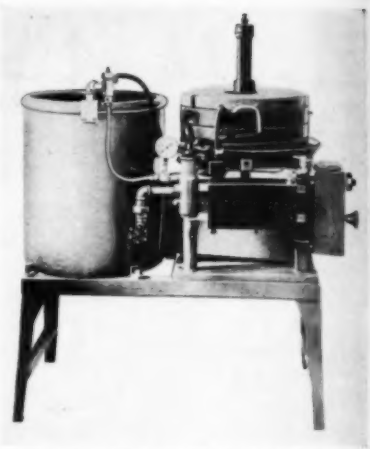
The gear box in the back of the machine, which is designed to move the machine backward or forward, is totally enclosed and running in oil and all gears are steel cut. The driving mechanism from the pivot shaft to the head end driving the conveyor is operated by two Condor V belts, made by the Manhattan Rubber Manufacturing Division, Passaic, N. J., placed side by side. These belts eliminate chance of slippage and are not affected by rain, cold or heat, making it possible to use this machine in all kinds of weather or in any climate.

According to the manufacturer, this conveyor will unload from any kind of mixer and place concrete on a road or in forms at the rate of a yard a minute. This is done by one man, without the use of wheelbarrows or buggies and no need of help in chuting the concrete from the mixer onto the belt. The operator stands on the running board on one side of the tractor and with the levers under his control can move the tractor conveyor into any position required. With the turnbuckles he can lower and raise the receiving or discharge end of the conveyor to suit the point or place where the concrete is to be deposited.

A New Electrolytic Chlorinator

SMALL water supplies for construction camps can be adequately and efficiently chlorinated with the new W & T electrolytic chlorinator, made by Wallace & Tiernan Co., Inc., Newark, N. J.

This chlorinator generates chlorine gas from a saturated brine solution, mixes the gas thoroughly with the correct proportion of water and delivers uniform chlorination at the point of application. The rate of gas generation is easily controlled by the turning of a rheostat. Should the water supply be accidentally cut off, gas generation automatically stops, as gas is generated only when it may be properly carried away.



The New W & T Electrolytic Chlorinator for Small Water Supplies in Construction Camps

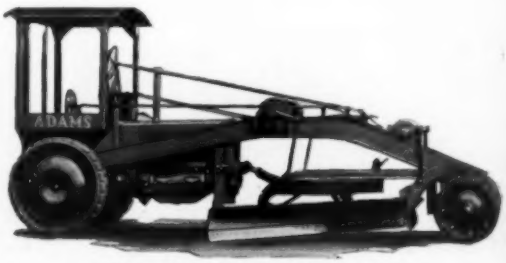
The unit is ruggedly built and is inexpensive in operation. The current consumption is the equivalent of one 150-watt bulb. Where current is not available, the chlorinator can be operated from dry cells or storage batteries.

A Heavier Motor Grader for Highway and Maintenance Work

THE Adams No. 15 motor grader, which is of the same general design as the No. 102 and is powered by a Case Model LI tractor, is manufactured by the J. D. Adams Co., Indianapolis, Ind. The tractor, which is made by the J. I. Case Co., Racine, Wis., is an industrial model, with a rated drawbar pull of 26-40 horsepower.

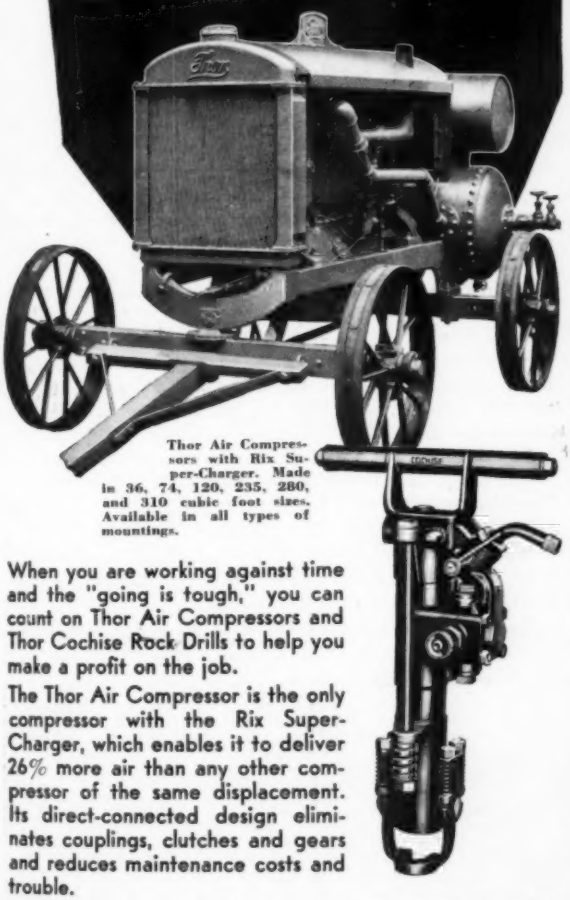
The features of the grader are its rigidity, greater effective weight on the blade and freedom from lost motion. The main frame beams, of heavy channel steel, are connected by four large tubular steel cross members securely welded to the beams, in order to prevent the frame from twisting or weaving. The grader's weight is distributed to put the greatest possible amount of weight on the blade, to hold the grader to a smooth steady cut. Machine-cut gears, machine-finished ball and socket connections and bearings throughout the blade control are all adjustable for wear.

The Adams No. 15 motor grader is furnished with a 10, 12, 14 or 16-foot blade, with or without scarifier, and cab. Other accessories, including curtains or wooden enclosure for the cab, Prest-O-Lite or electric lighting equipment, an odometer for recording mileage, wheel extension rims for the front wheels, tire chains and a snow plow, are furnished if they are desired.



The Adams No. 15 Motor Grader

Thor Air Compressors *and* Cochise Rock Drills



Thor Air Compressors with Rix Super-Charger. Made in 36, 74, 120, 235, 280, and 310 cubic foot sizes. Available in all types of mountings.

When you are working against time and the "going is tough," you can count on Thor Air Compressors and Thor Cochise Rock Drills to help you make a profit on the job.

The Thor Air Compressor is the only compressor with the Rix Super-Charger, which enables it to deliver 26% more air than any other compressor of the same displacement. Its direct-connected design eliminates couplings, clutches and gears and reduces maintenance costs and trouble.

The Thor Cochise Rock Drill is the fastest drilling machine of its size on the market. The saving in air consumption it makes possible is startling—from 30 to 50%. It is easily operated, because vibration is eliminated. Before you buy new equipment, investigate Thor. Write for literature.

Thor Cochise Rock Drill. Weight 51 lbs. Air Consumption is 60 cubic feet per minute. Made in wet and dry types. Furnished mounted or unmounted.

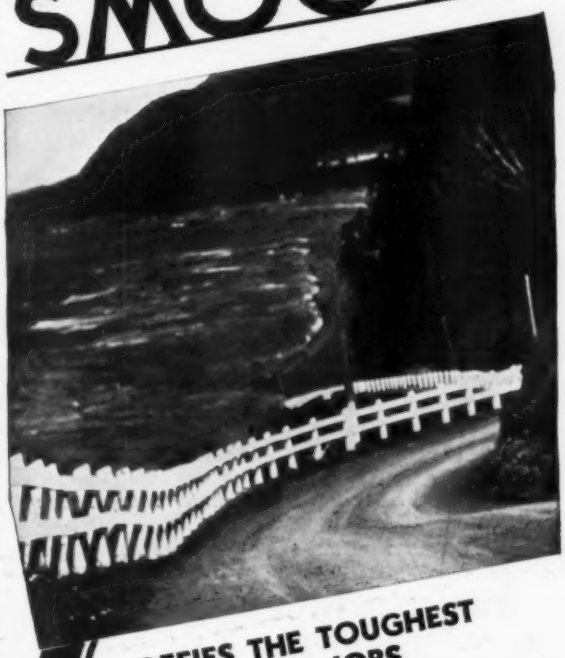
INDEPENDENT PNEUMATIC TOOL CO.

New York ..... 17 YEARS OF AIR-EXPERIENCE ..... London

PNEUMATIC TOOLS · ELECTRIC Thor TOOLS · AIR COMPRESSORS

248 S. JEFFERSON ST. CHICAGO, ILLINOIS

SMOOTH



DEFIES THE TOUGHEST ROAD JOBS

THE HUBER MOTOR ROLLER is built to handle all highway and street construction jobs. Its tremendously smooth power and great structural strength form an unbeatable combination for efficient and long life service. Huber Motor Rollers are economically handling a variety of jobs on the highways of the country.

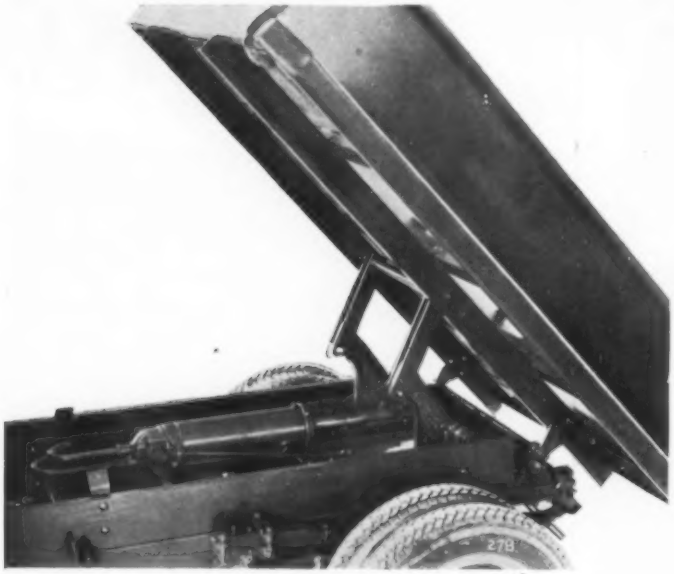
Write for new Huber Catalog

THE HUBER MFG. CO.
330 E. Center St.
MARION, OHIO

HUBER

HUBER 12 POINT PERFORMANCE
RUGGED SAFE
FAST SMOOTH
POWERFUL FAITHFUL
BALANCED LASTING
FLEXIBLE ACCURATE
PROFITABLE PRACTICAL

HUBER
MOTOR ROLLERS



An S-541 Superior Hoist for Dump Bodies

An Hydraulic Power Hoist for Intermediate Trucks

A 5-INCH underbody heavy-duty hydraulic hoist which is shipped complete ready to mount with wood sills and equipped with a power take-off, body hinges and all parts necessary for installation, has been developed by the Superior Body Corp., Marion, Ind., in its Superior power hoist. The wood sills are standard equipment and are bolted to the steel subframe on which the hoist is mounted. The oil pump is small, compact and powerful and is so mounted as to cause no interference with the truck brake rods. High pressure oil tubing is used between the pump and the cylinder head and low pressure tubing on the return line.

The valve head on the cylinder contains the check valve which locks the body in any desired position. The valve in the head is closed automatically by the stroke of the piston in the high grade steel ground cylinder.

The cylinder is equipped with two tie-rods extending from the cylinder head to the body frame which takes the entire strain off the hoist. The manufacturers claim that this is the strongest possible hoist construction. The dumping or lifting casting which raises the body through a link is so designed as to give maximum lifting power with a minimum pressure on the oil and also eliminates the possibility of the body tipping backward. The dumping angle control pin which may be used in any one of three positions on the link changes the dumping angle from 45 to 50 or 55 degrees, if desired, without loss of energy from the cylinder and without the need of extra parts.

A New Hammerhead Boom for Steel Erection

A HAMMERHEAD boom for use in steel erection has recently been developed by the Northwest Engineering Co., 28 East Jackson Blvd., Chicago, Ill. This type of boom has been used considerably on locomotive cranes in the past but, according to the manufacturer, this is the first time that it has been applied to a crawler.

The hammerhead boom is provided with sheaves for a five-part line and is designed to keep the load away from the boom structure.

A New Backfiller and Bulldozer

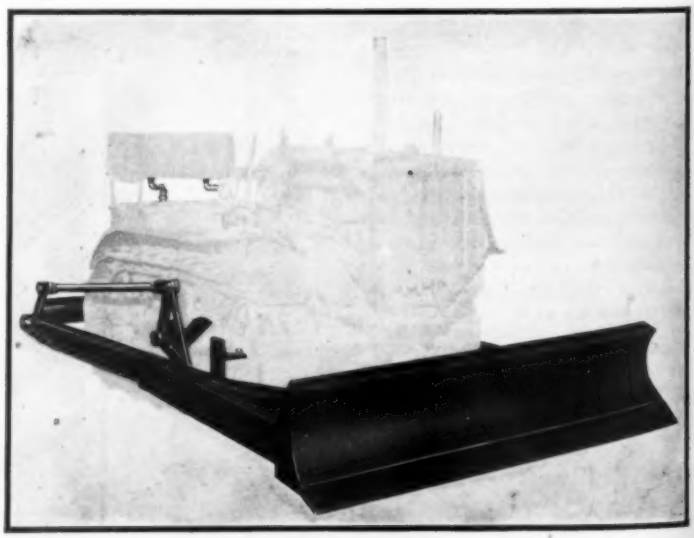
A BACKFILLER-bulldozer designed to incorporate in a single unit the strength of a bulldozer with the versatility of a reversible blade backfiller, has been placed on the market by the Davis Manufacturing Co., Davis, Calif. The Hydrig backfiller-bulldozer consists of a reversible blade riveted on a frame yoke in front of the tractor. It is held in position by the pivot and by supporting struts connecting with side members which rest on the track frames of the tractor. An hydraulic jack rigidly mounted to the drawbar frame actuates the patented Hydrig lifting device which provides easy and accurate control of the cutting or spreading depth of the moldboard.

The blade can be quickly changed from the usual bulldozer position to an angling one by removing two pins and swinging the moldboard. When operating at an angle the moldboard ends and the supporting struts from the moldboard to the side frames act as a landslide which keeps the tractor on its course. An easily-attached end point may be provided for cutting into banks and dislodging trees and boulders.

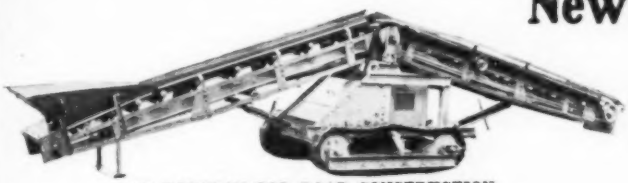
Large capacity is obtained by the curvature of the moldboard which digs in and rolls the dirt ahead instead of merely shoving it. The balanced construction of the Hydrig distributes the weight of the unit evenly over the entire track surface of the tractor, while the swivel links, connecting the lifting device to the frame, throw the force of the load and any sudden impact on the drawbar assembly. Both the drawbar assembly and the moldboard are built especially strong.

The moldboard is a reinforced steel plate cold bent to form with a 6 x ½-inch reversible cutting edge of high carbon steel. The lifting mechanism is hydraulic with a heavy-duty gear type pump and a cylinder rigidly mounted on the drawbar frame.

The Hydrig backfiller-bulldozer is built for all track-type tractors and is easily mounted without drilling holes or changing the tractor frame.



The Hydrig Backfiller-Bulldozer



IN POSITION FOR ROAD CONSTRUCTION

New Machine Speeds Up Concrete Road Work

Simplifies the Carrying and Spreading of Mixed Concrete

Here are two views of the new *Conveigh Tractor Conveyor*—(1) in position for carrying and spreading concrete in roadwork, and (2) ready to transport concrete to forms for retaining walls or foundations.

In road work, it is estimated that as much as $6,000 a mile can be saved by the use of this new time-saving machine. Mounted on a tractor and keeping abreast of the work continually, it takes concrete from the transit or stationary mixer and lays it down in the roadway evenly and speedily.

For the construction of retaining walls, one end of the machine can be raised to a considerable height.

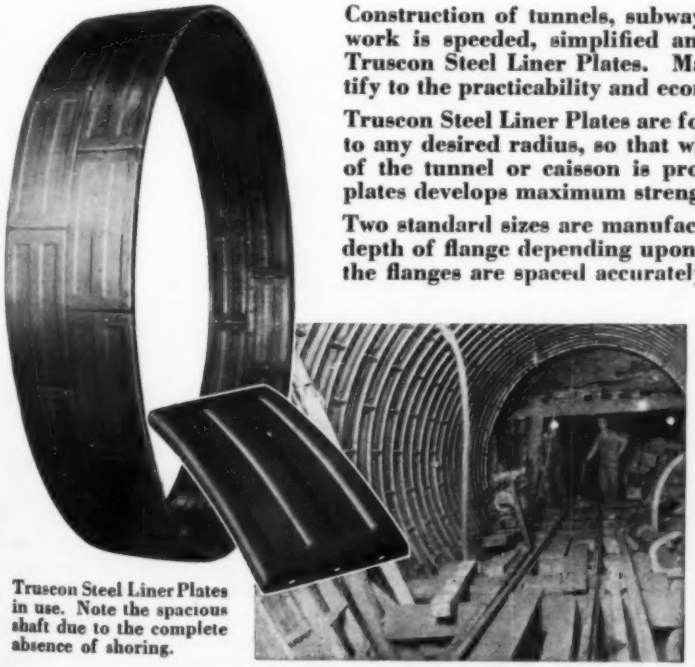
The conveyor carries the concrete automatically to top of forms and drops it into place.

Write for further interesting details about this simple, effective, time-saving machine.

IN POSITION FOR BUILDING WALLS

THE CONVEYING WEIGHER CO.
90 West Street
New York City

TRUSCON STEEL LINER PLATES
for Tunnels and Caissons



Truscon Steel Liner Plates in use. Note the spacious shaft due to the complete absence of shoring.

Construction of tunnels, subways, caissons and other underground work is speeded, simplified and safeguarded through the use of Truscon Steel Liner Plates. Many well-known, successful jobs testify to the practicability and economy of this method.

Truscon Steel Liner Plates are formed of individual segments curved to any desired radius, so that when assembled by bolting, a section of the tunnel or caisson is produced. The special design of the plates develops maximum strength and assures absolute uniformity.

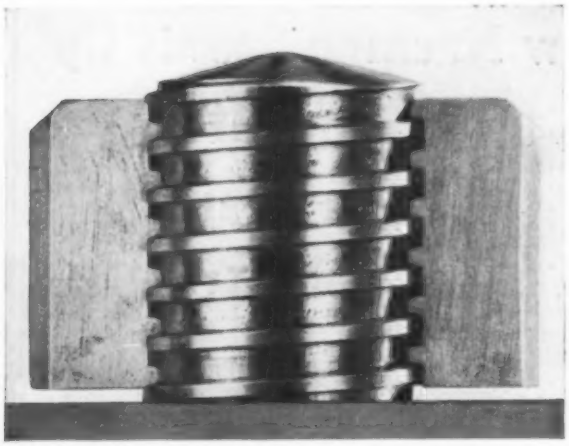
Two standard sizes are manufactured; the radius, gage of steel and depth of flange depending upon individual requirements. Holes in the flanges are spaced accurately to insure easy and rapid erection.

Caulking or gaskets are readily applied when air pressure is to be used in caisson work.

No complicated assembly is involved and no special tools are necessary. Shoring is eliminated and a considerable reduction in the excavating is made because of the narrow, rigid steel shell.

Suggestions, catalog and prices furnished without obligation

TRUSCON STEEL COMPANY
PRESSED STEEL DIVISION
CLEVELAND, OHIO



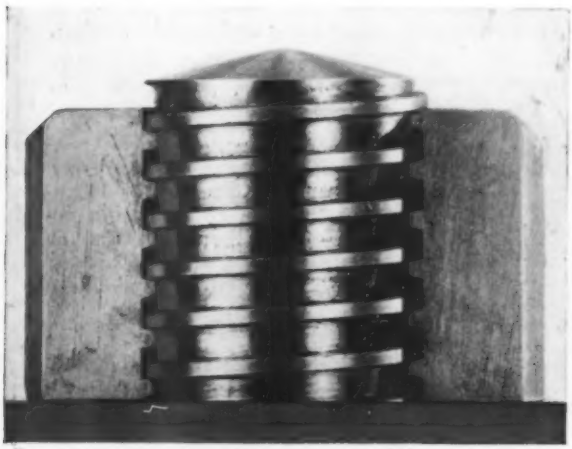
The Dardelet Self-Locking Screw Unlocked

A Self-Locking Nut and Bolt

A SELF-LOCKING screw thread that locks by reason of the profile of the thread, has been developed by the Dardelet Threadlock Corp., 120 Broadway, New York, N. Y. This self-locking thread has been used successfully in the temporary assembly of structural steel work for constructing bridges where vibration is continuous and is now being used by railroads for rail bolts. The Dardelet principle can be applied wherever screw threads are used as a fastening and the locking action is effective at any point along the thread.

The Dardelet thread locks by reason of its mathematically designed profile. Examination of the illustration shows that there is a taper of about 6 degrees at the bottom of the bolt thread groove and a corresponding taper on the crest of the nut thread. These are the locking surfaces. When the nut is being screwed on the bolt, it moves freely along the bolt surface until it comes in contact with the work. After it comes in contact with the work, a partial turn of the wrench causes the nut to rotate without advancing on the bolt. This forces the crest of the nut thread to move directly across the bolt thread groove until the flanks meet and the tapered thread faces are powerfully wedged together. The tension on the bolt may then be increased as desired by screwing up the nut after it is frictionally locked but this does not reduce the holding effect of the friction lock between the nut and bolt.

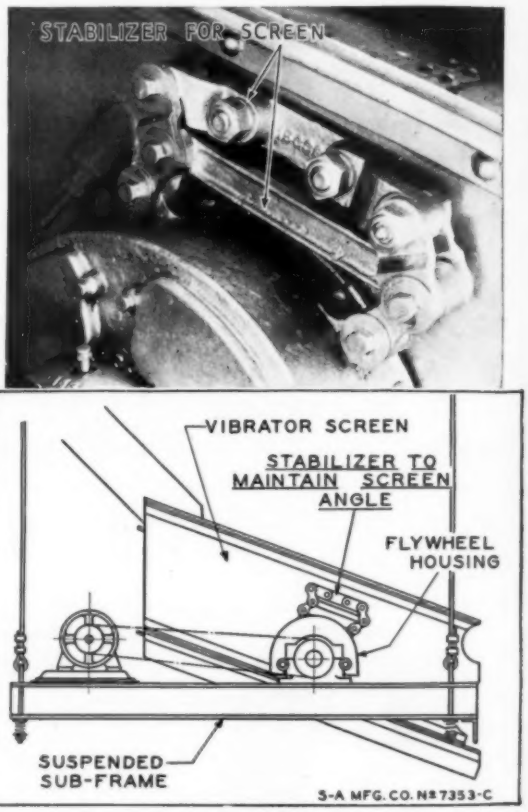
To unlock the nut, it is turned backward with a wrench. It can then be spun off with the fingers. Both bolt and nut are uninjured by the locking action and can therefore be used repeatedly. The facility with which the nut can be spun onto the bolt by hand and then turned up to lock with an ordinary wrench and the ease with which they may be unlocked with the wrench make them particularly desirable for construction work.



The Dardelet Screw Locked

New Mounting for Screens

A NEW stabilizer for vibrating screen mounting has recently been developed by the Stephens-Adamson Mfg. Co., Aurora, Ill. Ordinarily vibrating screens are balanced upon springs which hold the spring body at the proper screening angle and yet are flexible enough to permit the screen to be given a vibrating motion. In this new mounting, the springs have been replaced by a single mechanical unit



The New Stephens-Adamson Stabilizer

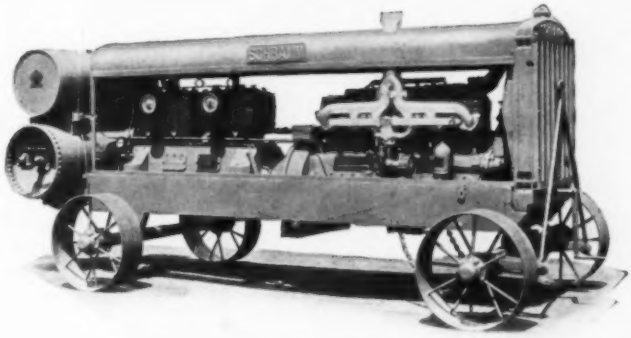
called a stabilizer. This is mounted on one side of the screen and while the screen body can vibrate freely with the eccentric drive shaft, it can not be rocked or bounced by sudden surges of material over the screen. The unit is light in weight and simple in construction. It holds the screen at a definite screening angle and yet offers no resistance to the vibration action. The screen body can quickly be shifted to a new angle simply by loosening two bolts on one side.

The stabilizer consists of two pairs of short cast steel arms, each jointed in the middle, and held parallel by a heavy cross bar. One end of each arm pivots on the flywheel housing, which is solidly mounted on the heavy steel subframe. The other end of each arm is free to move in a shackle on the screen body. The arms are free to swing or bend in any direction, but both must act together. Even in screens having a long throw, the movement of the stabilizer arms is so slight that there is practically no wear on the parts. All arms and brackets are of cast steel, and the hinge pins are equipped with Nathan automatic oil feeders, which force oil under constant pressure to the moving surfaces.

Why SCHRAMM can build BIG AIR COMPRESSORS

540 cubic foot

PORTABLE ENGINE DRIVEN COMPRESSOR



There's plenty more worth knowing . . . and bulletin 3106 will let you in on the entire story.

New in size only . . . the biggest portable compressor on the market . . . but completely SCHRAMM in design, with all the famous SCHRAMM features, SCHRAMM materials and workmanship, SCHRAMM dependability, convenience and interchangeability.

The heavy-duty, self-aligning clutch . . . easy starting . . . just turn over engine and throw in clutch . . . and that's why we can build 'em big like the 540. Multi-cylinder units . . . well balanced . . . free from vibration . . . light in weight, therefore, a real portable outfit.

Schramm

INC., West Chester, Penna.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

BETTER THAN EVER

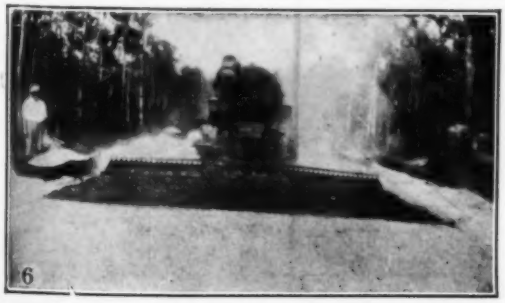
A SUPER OIL, TAR and ASPHALT DISTRIBUTOR

— *for* Etnyre OREGON ILL. *1931* —

That is what
STATE OFFICIALS, COUNTY OFFICIALS and CONTRACTORS
will find embodied in the 1931

"ETNYRE MODEL F"

Designed and built to maintain and produce the best kind of BITUMINOUS ROADS by applying the material in just the right amount at the proper temperature.



This is an actual photograph of an "ETNYRE MODEL F" applying 7/10 gallons per square yard, asphalt heated to 340 degrees F. with 18' spray bars on the Sanford-Orlando Road No. 3 in Florida. This is a splendid example of

"ETNYRE FULL WIDTH DISTRIBUTION"

The first application of 2 gallons per square yard was also applied with 18' spray bars.

Let us send you bulletin No. 503 giving specifications and more interesting facts.

Manufactured by

E. D. ETNYRE & COMPANY
Oregon, Illinois

SALES OFFICES IN PRINCIPAL CITIES

Two Views of the Warco Dump Body Attachment for Power Graders Working on the Streets of North Little Rock, Ark.

A Dump Body Attachment for Power Graders

OF particular value to those communities who have power grader equipment, but do not have motor trucks, or where motor trucks may be needed for other purposes, is the dump body attachment for power graders recently brought out by W. A. Riddell Co., Bucyrus, Ohio. This dump body has a capacity of 1½ cubic yards and can now be furnished on Warco center control power graders. Dumping may be either mechanical or by gravity, as desired.

The outfit appeals to officials in charge of city and rural roads where patching is necessary at the same time that maintenance is required. The operator can start out in the morning with a load of patching material, such as screenings, crushed stone, or whatever may be required, filling in the necessary holes along the way and then blading down the material to form a smooth roadway, all in one operation. Contractors find it helpful in fine grading and in maintaining detours.

Asphalt Plank Flooring

ASPHALT plank is unlike other flooring. Safe-T-Plank, made by The Flintkote Co., Park Square Bldg., Boston, Mass., is a dense, hard, tough composition of asphalt, fiber and mineral matter. It is manufactured in slabs or units of convenient dimensions and is easily laid by common labor with ordinary tools. It does not shrink, swell, warp or check, nor does it absorb moisture and it is proof against decay.

Asphalt plank is but slightly affected by extremes of temperature and, unlike some asphalt pavements, it does not corrugate or become wavy. Neither does it become soft in hot weather, but remains firm and elastic at all times. The plank can be applied to wood bases by nailing and to concrete bases by cementing with hot asphalt or asphalt emulsion. It can be easily replaced, being made in lumber form. It improves with age in use, as the action of traffic tends to roll and compress it to an even, uniform texture, so that a smooth, unbroken surface results.

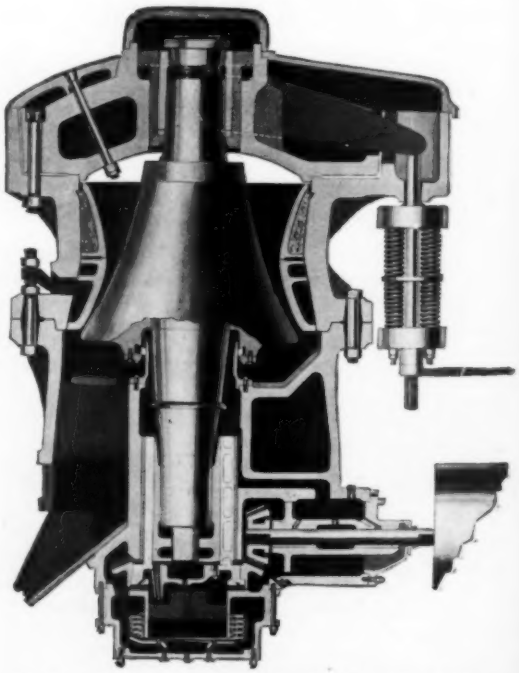
Safe-T-Plank is manufactured in thicknesses of ¾ to 2 inches and in widths of 6, 8, 10 and 12 inches, depending upon the thickness. Standard lengths are 3 feet for lesser thicknesses and 6 feet for the heavier materials. It is manufactured in standard cross sections, namely, straight-side and shiplap.

This planking is intended primarily as a wearing surface on bridges, viaducts, loading platforms and other locations where the loads are furnished by moving traffic. The surface upon which the asphalt plank is laid should be firm and reasonably smooth and free from undesirable irregularities. There can be no loose planks, no decayed spots, no projecting nailheads and the least amount of deflection in the base as possible. When it is to be applied over an old floor, all decayed or badly worn planks should be removed and replaced with new timber and the surface made to conform to the true grade. Asphalt planking is usually laid with the length of the section parallel to the direction of traffic. Conditions may alter this and, in such cases, it may be laid transversely or diagonally. Application of any bituminous paint, pitch or cement as a coating over the surface on which the planking is to be laid is not necessary and is not recommended. Sharp sand is sometimes sprinkled over the surface and allowed to remain while traffic imbeds it into the surface. Safe-T-Plank is not slippery, wet or dry. It is a stable material and contains no oils or other liquids to ooze out and form a sticky coating. The character of its surface is not affected by temperature change.

A New Reduction Crusher

A NEW reduction crusher, known as the Type TZ, has recently been announced by the Traylor Engineering & Manufacturing Co., Allentown, Penna. This machine is designed with heavy proportions and is built in six sizes capable of hourly production ranging from about 15 tons, ½-inch ring size, in the smallest machine, to nearly 1,000 tons, 2½-inch ring, in the largest size.

The crusher is of the gyratory type with a bell shaped crushing head and the concaves are sharply convexed from the top to the bottom of the bowl, in order to eliminate choking. It has a balance lever and tension springs to support the head



A Cross Section of the Traylor TZ Gyratory Reduction Crusher

HOIST CONVENIENCE

Type "S-LG" Double Drum Hoist

Convenience is a very necessary factor in hoist design and was emphasized in the design of

DAKE Gasoline and Electric Hoists

All operating and control levers for the hoist and power unit are within easy reach from the operators position. The Continental gasoline engine has all accessories get-at-able from the rear end. Convenience means better attention, less stops and delays, more work and a better profit producer for you on the job. Look for this hoist convenience when you buy.

Catalog and full information on request

DAKE ENGINE COMPANY Grand Haven Michigan

Sturdy?

Look it over

Schaefer CLEVELAND

ONE-MAN AUTOMATIC

Tractor Scraper

STURDY—ECONOMICAL—LABOR SAVING

All three of these advantages are found in the SCHAEFER One-Man Automatic Tractor Scraper.
Nearly ten thousand in use the world over, developing roads, streets, grading parks, golf courses and airplane landing fields and in fact doing anything that is possible with a scraper of this type.
It will pay you to investigate this outstanding tractor scraper. Do it today!

Four sizes: scraper widths, 4, 5, 6, 7 feet

The Gustav Schaefer Company
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Contractors who have used the Littleford Squeegee Machine to apply filler to brick or wood block paving declare that it is one of their greatest time savers. It applies the filler and squeegees it into the interstices all in one operation.
Many highway departments and contractors use the Squeegee Machine exclusively to apply seal coating on rock asphalt, black base and asphaltic concrete pavements.

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and shaft, the springs being adjusted to a tension sufficient to withstand the downward thrust of the head due to crushing, and yet allow the head to be depressed to a liberal degree. The head may be adjusted during operation, for varying the size of the product, the adjustment range in any machine being 50 per cent. No feeder is required as the Type TZ operates most efficiently when surcharged or flooded.

Other features of this crusher includes the bar-type non-weaving spider, the non-deflecting main shaft, the self-aligning eccentric bearing, the automatic lubrication system with all the elements contained in a sealed chamber, and the positive dust sealing device which excludes dust and grit from the working parts.

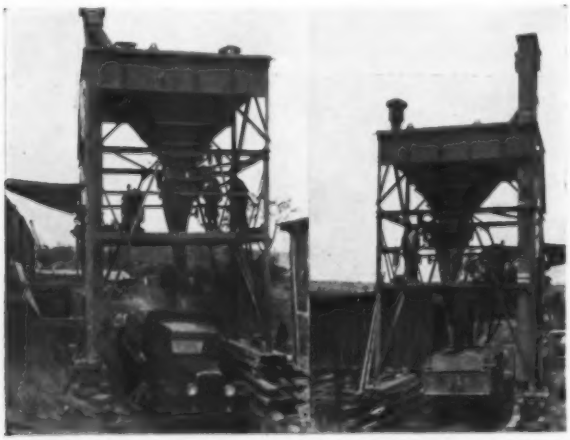
Portable and Stationary Types of Bulk Cement Handling Plants

COMPLETE bulk cement handling plants save time and expedite batching in the trucks or batch boxes. They save labor in handling cement, they prevent sack loss and eliminate the baling of empty sacks, money is saved in the cost of cement and the bulk cement can be measured more accurately, because each and every batch is weighed, giving better control of the mix. Blaw-Knox Co., Pittsburgh, Pa., offers two types of equipment for handling bulk cement, a portable type and a stationary type plant.

The portable type of plant consists of a portable cement bin with cover, all built of steel and self-cleaning. With this is a weighing batcher arranged to prevent dusting of the cement. This is shipped assembled on the bin ready for service. A power shovel or scoop is used for unloading the cement from the cars when shipment is made by rail. The cement is dumped into a folding boot hopper which empties to the foot of an enclosed vertical bucket elevator which loads the cement into the storage bin.

The stationary type of bulk cement plant can be moved by dismantling the bins and measuring equipment. The units of equipment for the stationary type plant are the same as for the portable type, except that the bin capacities are usually larger and frequently the bins are arranged to accommodate more than one kind of cement. This is of particular value at ready-mixed concrete plants where different customers may specify different brands of cement.

As an adjunct to the bulk cement handling equipment is the Cementank for mounting on batch trucks. This steel cement container is moisture-proof, equipped with a top cover and a discharge door which opens automatically when the compartment is dumped.



Two Views of a Blaw-Knox Bulk Cement Plant Used by Adam Eidemiller, Latrobe, Pa.

An Armco Boring Machine Installing 18-Inch Corrugated Iron Pipe Without Hindrance to Traffic

Boring Machine for Installing Small Diameter Pipe

SOFT spots in the roadbeds of highways and railroads have long been sources of trouble and expense to maintenance men. Increasingly heavier rolling equipment on railroads and high speeds have aggravated such conditions and emphasized the need for a quick economical method of installing pipes which would not interfere with the use of the traveled surface. To meet this need the Armco Culvert Manufacturers Association, Middletown, Ohio, has developed a boring machine for installing corrugated iron drain pipe in 8, 12 and 18-inch diameters.

The Armco boring machine serves the double function of excavating and removing the material replaced by the pipe. The entire machine is mounted on a track upon which it is moved forward as jacking progresses. The jacking itself is done by hand at the rear of the machine by means of an especially designed jack operating on a rack between the rails of the track on which the machine moves. Power for excavating is provided by a gasoline motor and is transmitted to the borer by a shaft extending through the pipe. A spiral conveyor is built around this shaft, which, as it revolves, removes the spoil through the pipe upon a smooth metal trough placed in the invert. When a section of pipe has been placed the machine is returned to the starting point, another section of pipe and a corresponding length of lining and conveyor attached and the process repeated. This is repeated until the required amount of pipe is placed.

The Armco boring machine, which has already proved its value in actual service, avoids many of the objections to the installation of drainage by the open trench method. It eliminates a long construction period with its attendant detours, slow orders and interrupted train schedules. Traffic is not interfered with while construction is in progress, neither is there an unstable roadbed or a marred pavement to be maintained for a long period after the job has been completed.

Although subdrainage installations probably present the greatest opportunity in the use of this machine, it has also been found applicable for installing conduits for gas, water, telephone and electric light lines, small drainage openings or any other purpose for which a small diameter pipe is satisfactory.

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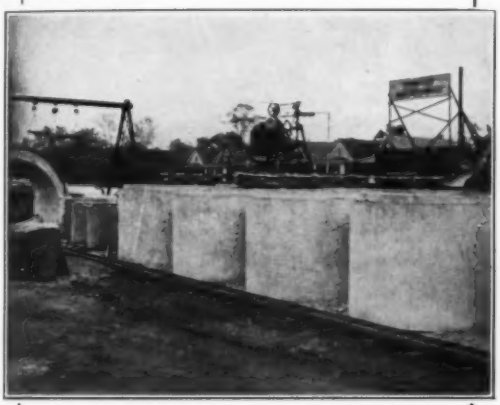

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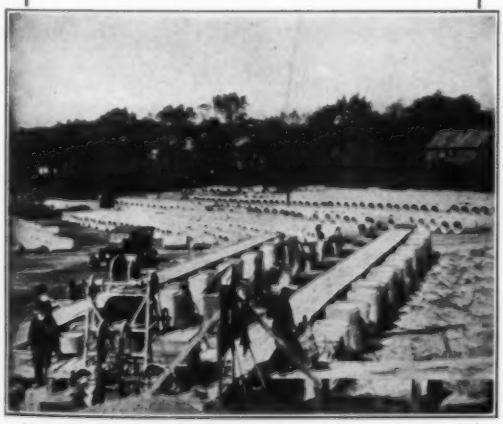

EXCLUSIVE RESORT

builds sewage treatment plant . . . UNDERGROUND!

Spring Lake, N. J., is one of the most delightful and exclusive summer resorts in the country. Everything about the town is attractive and its great expanse of sandy beach presents a most colorful spectacle any day in July or August.

To protect this beautiful beach from the danger of pollution by sewage, the municipal officials decided to build a modern treatment plant. But the most economical site, adjacent to the beach and ocean, was considered undesirable, even if the plant were neat and odorless.

The photo above shows how the problem was solved. The plant was built right next to the beach—but it is underground. The only visible portions are a small pump house and a flag pole. The latter is hollow and does double duty by serving as a ventilator through which an exhaust fan pulls air.

The Dorr Equipment used in this plant includes a Bar Screen, three Traction Clarifiers, two Sludge Pumps and a gas-collection Digester. In the winter the gas from the Digester is used to heat digesting sludge; in the summer it is used in the laundry of the South bathing pavilion.

This plant demonstrates convincingly how modern sewage treatment methods may be adapted to meet the individual requirements of different localities. Our engineers will furnish full information on the ways in which Dorr Equipment can be applied to various methods of sewage treatment.

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The Hanson Excavator Equipped as a Trench Hoe

A Quickly-Convertible Excavator

AN excavator which can readily be converted to shovel, clamshell, trench hoe, skimmer, crane or dragline with little effort in the field, is made by the Hanson Clutch & Machinery Co., Tiffin, Ohio.

With the Hanson Model 32 excavator, the operator can swing, crowd, hoist or propel the machine simultaneously as all operations are independent of each other.

The excavator is powered with a McCormick-Deering 4½ x 5 engine and has a swing speed of 4½ revolutions per minute. It has a tail swing of 7 feet 5 inches, a clearance under the deck of 33 inches, and a clearance over the top of the cab of 9 feet 8 inches. The crawlers on which the excavator is mounted are 8 feet wide overall and 10 feet long, with shoes 15 inches wide. The ground bearing pressure is 8 pounds per square inch and the travel speed 2 miles per hour.

The excavator will handle a ⅜ or ½-yard bucket. Equipped as a crane, the machine has a boom 20 to 40 feet long and will handle 10,000 pounds at a 10-foot radius or 3,700 pounds at a 20-foot radius. The maximum clamshell dumping height is 30 feet. With shovel equipment, the boom is 16 feet long and the excavator has a maximum dumping height of 15½ feet, and a digging depth of 5 feet. The trench hoe equipment has a boom 16 feet long and a hoe arm 8 feet long. It will dig to a depth of 14 feet over a radius of 25 feet.

Safety and Health in Tunnel and Caisson Work

THIS pamphlet, one of the Industrial Safety Series, is published by the National Safety Council, 20 North Wacker Drive, Chicago, Ill., in the interest of the safety and health of men engaged in tunnel and caisson work. Modern methods in this type of construction, together with the use of compressed air, have made possible the construction under water of long, large tunnels for water supply, sewers and vehicular traffic, and the carrying to bed rock of foundations for skyscrapers, bridges and dams. In subterranean and subaqueous operations caving soil, quicksand and water are encountered and make it necessary that the work be carried on under varying and difficult conditions.

Tunnel and caisson work is considered more hazardous to life and limb than many occupations because it is carried on underground in confined spaces. Besides the possibility of accidents such as may occur in ordinary industrial plants, there are additional and greater dangers from falls of ground, use of compressed air and the handling and use of explosives. In this pamphlet are suggested many ways of caring for the safety and health of the employees on underground work, including fire protection, general sanitation, handling of explosives, etc.

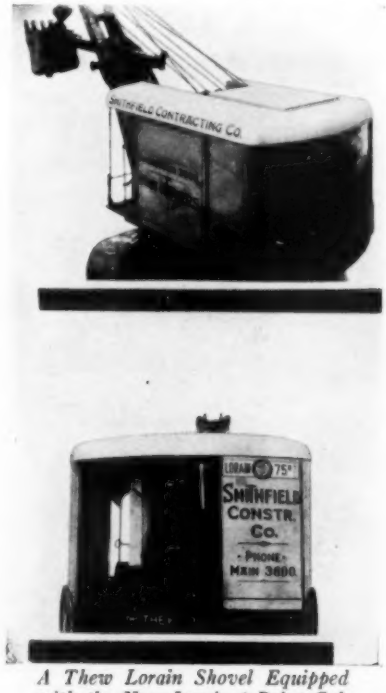
A New Cab for Shovels and Cranes

A NEW cab containing many features which contribute both to the efficiency and comfort of the operator, has been announced by the Thew Shovel Co., Lorain, Ohio, as standard equipment on its complete line of shovels and cranes. It is known as the Lorain 6-point cab as it has six features, appearance, accessibility, visibility, ventilation, protection and safety.

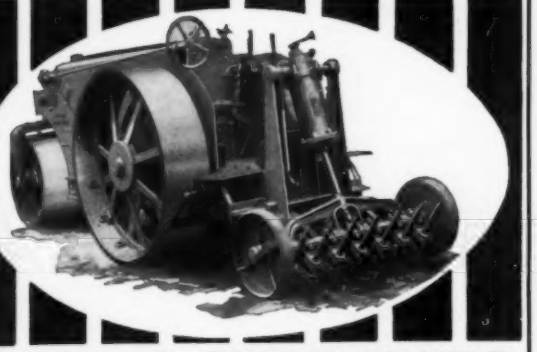
A change in appearance is achieved by the substitution of curves for angles throughout the entire structure, and the roof, rear corner posts, back and side panels are all designed to give a pleasing appearance. The cab doors, which slide from the inside, are so placed as to give proper ventilation, accessibility and visibility. The rear of the cab consists of three full length sliding panels on three separate tracks. These doors may be nested together, making it possible to open up any two-thirds of the back from the floor to the roof, thus allowing the operator a full view through the rear of the unit. By means of a locking device, the doors may be held in any position desired and are prevented from sliding back and forth.

To further increase accessibility and ventilation, the doors of the side panels are placed at each end of the motor, which in turn is placed so that the hot engine air is blown away from the operator. A larger roof hatch is located directly above the motor, making a total of 108 square feet of wall space which may be opened up for ventilating and cooling purposes.

This cab is of all-steel construction, the rear doors are of extra heavy gage steel and the tracks are welded to the curved roof section, serving as a reinforcement along the bottom edge of the roof for the full width of the machine. Shoulder pads have been added to the rear counterweight casting which extend up and around and protect the rear curved corner posts. Two hinged doors at the front of the cab make it possible to completely close and lock the turntable, giving protection from weather and theft. Other features of this cab are dust covers for the machinery, rear guards, non-skid protective floor plates, cab cut-off on the right as well as a tool box, pinch bar rack and clothes closet located in convenient places.



A Thew Lorain Shovel Equipped with the New Lorain 6-Point Cab



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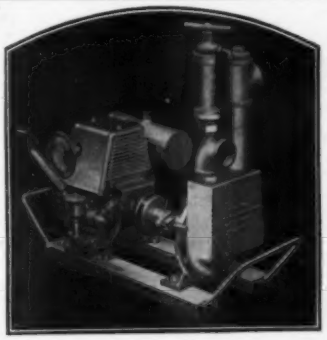

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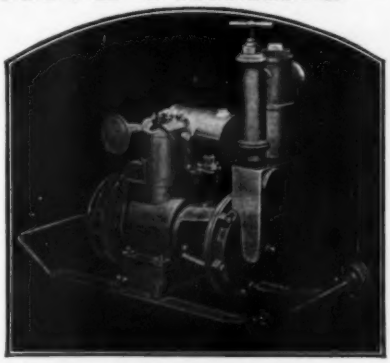

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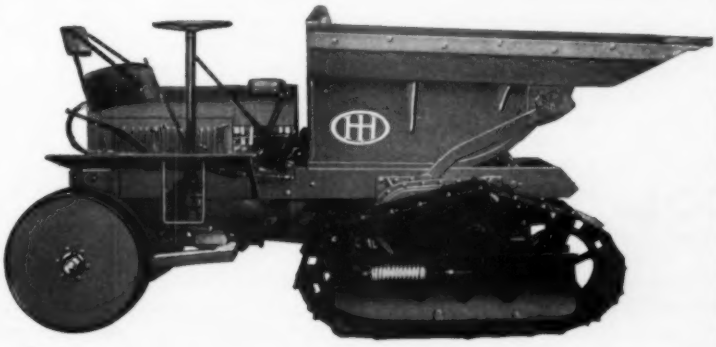
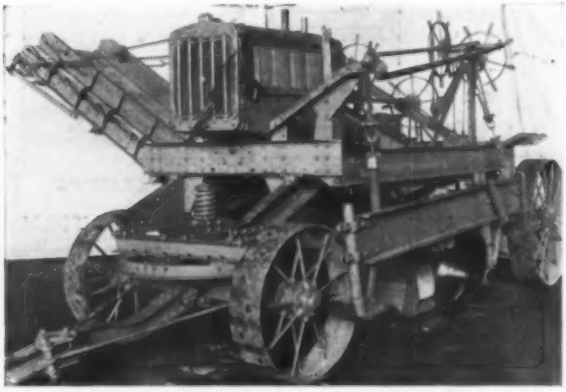


A New Elevating Grader with Engine-Drive Belt

THE new Caterpillar Sixty elevating grader which consists of a powerful engine to drive the belt, and a plow, so mounted to be hauled by a Sixty tractor, has been announced by the Caterpillar Tractor Co., Peoria, Ill. This grader takes its power directly through reducing gears from the crankshaft of the specially designed engine, through the main driveshaft and thence to the belt, aided by anti-friction bearings, where 25 horsepower is developed.

The length overall of this unit is 17 feet, the carrier length is 16 and 19 feet with belt lengths 33 and 39 feet and the 4-ply belt 42 inches in width. Its weight is 16,083 pounds. The wheelbase, center to center of the axles, is 13 feet, the front tread, center to center of the tires, is 6 feet and the rear tread, 8 feet. The main shaft is driven direct from the crankshaft of the engine which is mounted forward on the frame of the grader. The gear set runs in oil. The front end of the main shaft has a self-aligning coupling and the rear of the main shaft is mounted in self-aligning ball bearings. A 28-inch rigid disk plow is standard equipment. A rotary disk and moldboard plow are also available.



The Caterpillar Sixty Elevating Grader

A New Skip Mixer Scale

TO meet the requirements of concrete contractors for a means of providing accurate control of concrete aggregates, Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill., has recently announced a new skip mixer scale, a weighing machine designed to proportion accurately concrete mixes.

The Fairbanks skip mixer scale consists of an all-steel welded frame and beam box in which is mounted a specially designed Fairbanks knife edge lever scale with swiveled arm connections. Suspended from the scale levers is a welded steel spider onto which the skip is lowered for weighing. The scale is equipped with three ingredient beams made of non-corrosive metal graduated 1,500 pounds by 2 pounds, each of which is furnished with both a main and a fractional poise. There is also a tare for balancing the weight of the skip. These beams are enclosed in a steel beam box with doors on both sides, either one or both of which may be opened for operation and secured with a padlock when not in use, or the poises may be set by an inspector and the beam box locked during operation. A springless double-faced tell-tale showing over and under is mounted on a swivel so that it can be swung to any angle to insure easy reading.

When the scale is set up for operation, the transport wheels with which it is provided are removed and the scale allowed to rest on the ground on four large steel plate pedestals. The scale is placed adjacent to the mixer in such a position that when the skip is lowered it rests on the steel platform. Steel angle guides are provided to insure the skip resting squarely on the platform. With the skip in this position, the operator presses a foot lever which brings the scale parts into their proper places ready for weighing. The first ingredient beam is then released by pulling the trigger on the outside of the beam box. When the skip is in place, pressing a foot lever slacks the cables and with a disengaging joint between the skip and the mixer, the two are separated so that the scale bears the full weight of the skip. Then the poise on the tare beam is moved until the indicator shows balance, after which the poises on the three other beams are set in their predetermined places for the particular ingredients. Materials are then dumped into the skip. The over and under indicator gives evidence when the beam is approaching balance so that the last load can be stopped at the proper point. The operation is the same for each ingredient, each beam being released in turn by pulling a trigger outside the beam box. The ingredients are then hoisted in the skip and discharged into the mixer.

The New Fairbanks Skip Mixer Scale

As the skip is raised and leaves the platform, it trips an automatic safety gear which drops the platform to rest on the steel ground plates. Hence when the empty skip is returned, care in lowering into position is unnecessary for the pivots and bearings and all parts of the mechanism have been freed from the shock of dropping the skip by this automatic device.

Portable Carbide Lights

THE National Carbide V-G Light made by the National Carbide Sales Corp., Lincoln Building, New York, N. Y., has been somewhat enlarged, so that it will now take a 7-pound charge of carbide in the carbide chamber and 7 gallons of water in the water tank which is sufficient to maintain the light for 12 hours. This change only slightly increases the height and weight of the light, so that it now weighs 96 pounds charged and is 5½ feet high.

This company has also recently brought out the Handy-Light with an enclosed flame which is particularly handy for emergencies and for non-stationary outdoor operation. The base is broad and the center of gravity low, permitting it to stand on very uneven ground. The fact that it can be used intermittently without after-generation or carbide waste makes it a practical, all-purpose light. The reflector swings through practically every desired illuminating angle. Both the water tank and the carbide hopper are pressed steel drawn from open hearth, box-annealed, deep-drawing stock, tinned inside and outside and then painted. The only opening in the water tank or generator proper is sealed by a special rubber gasket.

The Enclosed V-G Handy-Light

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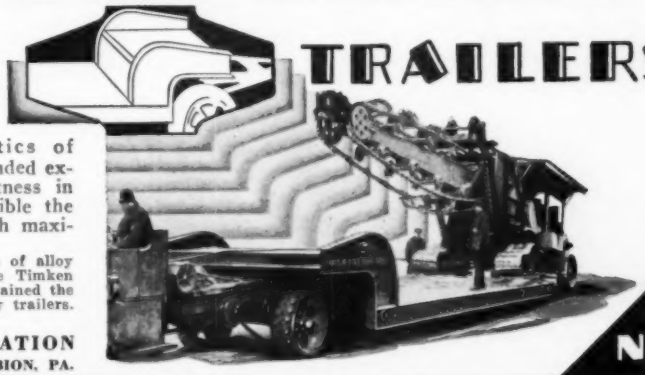

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Pages 4 to 32?

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a Safety Light that
does not invite theft

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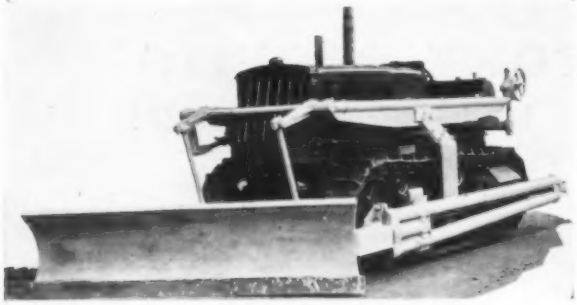

The New Hydraulically-Operated Trailbuilder

An Hydraulically-Operated Machine for Road and Trail Building

THE tractor-mounted, hydraulically-operated, reversible-blade Trailbuilder is manufactured by the Wooldridge Manufacturing Co., Los Angeles, Calif., and is designed for difficult jobs of trail and road building, bulldozing, leveling and similar work.

The blade on this Trailbuilder, which is concave so as to roll rather than push the dirt, is integral with the swivel, with the blade permanently adjusted to the most suitable cutting position for trail and road building. The blade assembly and horn member are united by a king pin to form a pivoting device by which the blade is adjustable from a straight bulldozing position to a right or left angle. The landside, a strut or stiff arm extending between the end of the blade and the side frame, serves to absorb shocks as well as to act as a guide to lessen side draft and enable the tractor to follow along any predetermined line without undue use of the steering mechanism. Horizontal blade adjustments are made through the rocker arm assembly.

The Trailbuilder is attached at its rear to the tractor drawbar and at its sides to the track frames of the tractor. By using a box-like structure and tubular drill rod, the load is evenly distributed over the entire track surface. The drawbar member is attached to the drawbar of the tractor. Adjustable pull chains from each side of the drawbar to the dead axles on the tractor automatically equalize corner strain and side draft. The hydraulic jack, controlled from the operator's seat, provides a powerful and speedy means of raising and lowering the blade. The hydraulic system consists of a heavy-duty gear type pump with a rotary 4-way valve for powering the blade either up or down, and permits oil to by-pass through the pump to the reservoir when in the holding position. This hydraulic power system can also be used for dump trailers, road scarifiers, road discs, wheel scrapers and other equipment for use with tractors.

The push members are constructed of tubular steel, in truss formation. A side rub plate is provided on both sides of the tractor as a guide for the push members. Self-aligning swivel bearings, mounted at the ends of the rocker arm assemblies, and trunnion bearings connecting the push members to the horn member, permit the oscillation of the blade and horn without placing undue twisting stresses on the side frame when raising and lowering one corner of the blade. The horn member is so designed as to work with the Trailbuilder blade or the backfiller blade and swivel, in case this floating type wider blade is desired. The horn is also quickly detachable if other front end attachments should be required.

A Small Truck or Tractor-Mounted Pump

A SMALL pump which uses the motive power from a tractor or truck by means of a patented power take-off, is made by the American Steam Pump Co., Battle Creek, Mich. The Barton portable pump is a specially designed centrifugal type pump of minimum weight and yet amply strong. As the weight of the pump is carried on the frame of the truck or tractor, it may be left on while driving without causing added strain on the engine. A floating shaft connects the pump to the engine and there is no unusual strain put upon the crankshaft.

When once installed the pump can be attached or detached in a few minutes. It is suitable for a maximum lift of 20 feet and, as the impeller is of the open type, dirty water containing sand or gravel can be handled without injury to the pump. A small hand clutch is furnished to disengage the engine while driving.

The Barton pump is made in four sizes, 1¼, 2½, 3 and 4 inches, with capacities ranging from 50 to 900 gallons per minute, depending upon the speed and discharge head. It is furnished complete with automatic primer, brass hose connection, brass discharge gate valve, and power take-off to fit the tractor or truck specified. Suction hose and foot valve are furnished on special order if desired.

This pump can be used for all kinds of jobs such as draining conduit tunnels, pumping out ditches, excavations, and cellars, furnishing water for road building or irrigation, removing drips from gas mains and for many other services.

A Barton Portable Pump Mounted on a McCormick-Deering Tractor

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LL — TANDEM SCREED

LI — SINGLE SCREED AND TAMPER

LIL — TANDEM SCREED AND TAMPER

LAKEWOOD TYPE "C" FINISHER offers the same advantages for the paving of city streets that it provides on concrete and bituminous highways ... faster production of smoother surfaces with fewer men and with adaptability that meets every job condition. Write for CATALOG CE

THE LAKEWOOD ENGINEERING COMPANY
COLUMBUS OHIO

Heltzel Weighing Plants

Are readily portable, fast, and accurate. All materials are weighed on one springless dial scale. Every batch can be checked without resetting any poises or balancing any scale beams. Write for complete data.

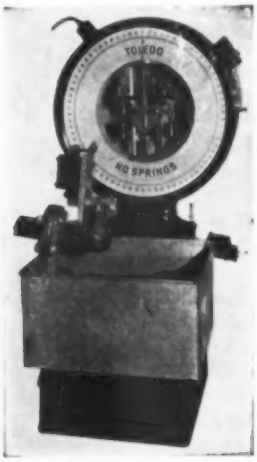
THE HELTZEL STEEL FORM & IRON COMPANY

Steel Forms for road, street, curb and sidewalk construction; a complete line of equipment for concrete contractor.

WARREN, OHIO.

A Dripless Valve Device for Measuring Liquids

A SOLENOID dripless valve has recently been developed which stops all dripping after the valve is closed. When the current is on, the valve is open and when the current is broken, the valve closes. The valve seat is placed at the outlet so that no liquid can flow after the valve is closed.



A Model Set-Up of the Toledo Solenoid Dripless Valve

With this valve, manufactured by Toledo Precision Devices, Inc., a subsidiary of the Toledo Scale Co., Toledo, Ohio, exact measures of any liquids are possible, as the flow can be instantly stopped. It was designed primarily for use with the Toledo Scale electric cut-off weighing device. With this attachment the liquid passes through the valve and flows into a container on the scale. An example of its use would be in measuring the exact amount of water desired for concrete at central mixing plants and ready-mixed concrete plants. As the container fills, the weight of its contents is automatically registered on the dial scale indicator. When the indicator reaches any predetermined weight, it passes over the electric eye, intercepting a beam of light, automatically cutting off the current, and thus stopping the flow through the valve. The valve comes in ½, 1 and 2-inch sizes.

Tunnel Liner Plates for Underground Construction

CONSTRUCTION of tunnels, subways and other underground passages can be speeded, simplified and safeguarded by the use of tunnel liner plates such as are manufactured by Truscon Steel Co., Pressed Steel Division, Cleveland, Ohio. Individual segments are accurately formed to any desired radius, so that when assembled by bolting, a section of a tunnel is produced.

Truscon steel liner plates are made in two standard sizes, the radius and gage of steel and depth of the flange depending upon individual requirements. The holes in the flanges are spaced accurately to insure easy and rapid erection. A feature of these tunnel liner plates is the ease with which they are handled and erected. The strength of the pressed steel plates is approximately three times that of cast iron of equal weight. No complicated assembly work is involved and no special tools are required. Much shoring is eliminated and a considerable reduction in excavating is made, because of the narrow rigid steel shell.

These plates are designed particularly for tunneling through soft or crumbly earth, quicksand or ground under heavy pressure or full of water. As excavating proceeds, additional narrow segments of the tunnel are pushing forward so that the men secure the maximum protection at all times. The plates also can be used to strengthen existing tunnels which may show signs of being water stressed or which require waterproofing.

Truscon Steel Liner Plates Erected and Ready for the Application of Gunite on the Moffat Tunnel Project

A Portable Screening, Crushing and Loading Plant

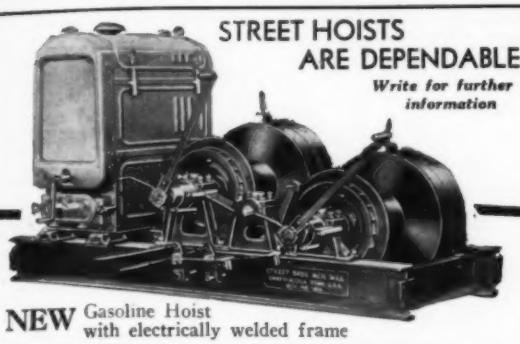
WHERE large daily gravel capacities are not needed, a medium-sized portable gravel plant will often be best-suited and most economical for the requirements of the job. The No. 22 Pioneer plant, which is similar in design and construction to the larger Pioneer plants, is manufactured by the Pioneer Gravel Equipment Manufacturing Co., 1515 Central Ave., Minneapolis, Minn. This plant has a capacity of 200 to 350 cubic yards in 10 hours, based on 1-inch reduction and 25 per cent oversize. It screens, crushes and loads in one operation, has a sand rejector and is operated by one man.

The Pioneer No. 22 Portable Screening, Crushing and Loading Plant

The arrangement of the plant is such as to provide the Pioneer closed-cycle screening and crushing process. The gravel is delivered to the shaker screen by means of a feeder conveyor, the hopper of which is equipped with a mechanical or plate-type feeder. The oversize is screened out on the shaker screen and delivered to the crusher. The materials that pass through the crusher are returned to the receiving end of the shaker screen by means of a bucket elevator so that particles still oversize will again go through the crusher for recrushing. All materials passing through the screen are delivered to the 2½-yard storage hopper and thence on to a delivery conveyor from which they are in turn delivered to trucks, storage bin or stockpile. This cycle permits the operation of the largest possible opening between the crusher jaws, the effect being to speed up production as well as to reduce the tendency of the materials to become pulverized. The plant is equipped with SKF ball bearings at all principal points of wear and has enclosed miter gears running in oil. A 40-horsepower gasoline engine is recommended for powering this plant, so speeded that the crusher will turn 250 rpm.

STREET HOISTS ARE DEPENDABLE

Write for further information



NEW Gasoline Hoist with electrically welded frame

STREET BROS. MACHINE WORKS, INC.

Chattanooga, Tenn.

MARION MULES

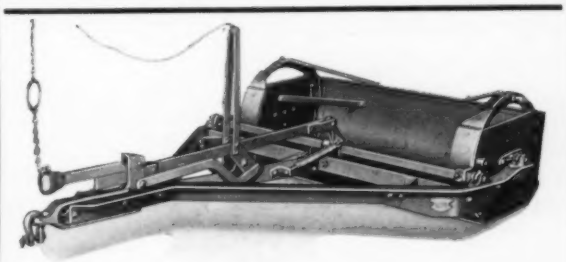
The oscillating front axle on Marion Mules permits an even haul over uneven roads, excavations, or fills. The angle of oscillation causes either front wheel to operate perfectly within a 21-inch verticle movement. . . . Rubber tires can be furnished as regular equipment as well as steel wheels or crawlers. . . . Complete information and prices will be mailed upon request.

MARION MULES INC.
MARION, OHIO

Engineers praise NEW

R C GROUNDHOG

Revolving Tractor Scraper



"Certainly a great improvement . . . so much easier to handle and operate . . . has any other scraper beat a mile."* Tractor driver operates scraper by rope controls, using any type of tractor, under any working conditions. Quick change to automatic or semi-automatic control. Tractor pulls scraper into cut, loads, pulls out of bite, carries, dumps and spreads load without attention of driver. Adjustable roller bowl stops.

** From actual letters in our files.*

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Mansfield, Ohio

Write *for* Facts

Having four types . . . Orange Peel, Clam Shell, Electric Motor, and Drag Line . . . of digging and rehandling buckets to draw from, makes a Hayward recommendation absolutely unbiased.

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Hayward Buckets

"The Strongest Geared Power for Its Weight in the World"

CAPACITY 5 TONS STRAIGHT LINE

POSITIVE INTERNAL BRAKE

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Weight 110-lbs.

Size 16x17x13-in. high

Two Speeds 4 to 1 24 to 1

Write for descriptive circular with user's endorsements and name of nearest dealer.

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LIDGERWOOD-OTIS "A" CRANE

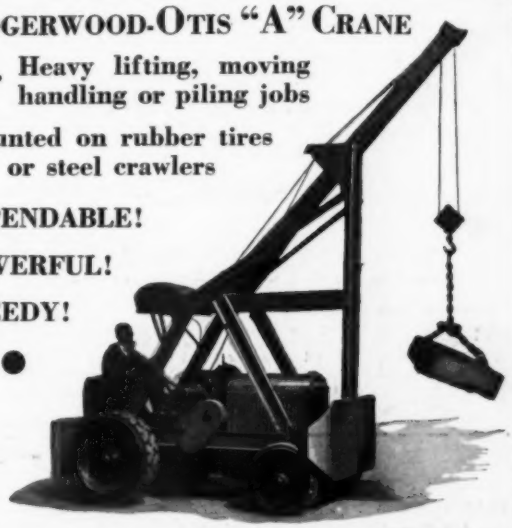
for Heavy lifting, moving handling or piling jobs

Mounted on rubber tires or steel crawlers

DEPENDABLE!

POWERFUL!

SPEEDY!



Heavy steel construction throughout with load carrying springs

2000-lb. counterweight gives greater traction and stability

Speed - - - - 12 miles per hour

Capacity - - - 4000 lbs. with 100% safety factor

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ELIZABETH, N. J.

A REAL SERVICE FOR OUR READERS

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

Excavating for Profit

153 This is the title of a handbook on the slackline cableway method of digging and conveying materias, illustrating and describing the Sauerman excavating equipment and methods. Copies of this booklet may be secured by those interested by writing Sauerman Bros., Inc., 464 So. Clinton St., Chicago, Ill., and requesting Catalog 12.

A Finisher for Highways and Streets

154 The Lakewood Type C finisher for use on concrete and bituminous streets and highways, which gives fast production of smooth surfaces with fewer men and an adaptability which meets every job condition, is described in Catalog CE which the Lakewood Engineering Co., Columbus, Ohio, will be glad to send on request.

A Concrete Accelerator and Hardener

155 Acqua-Pruf, Inc., 393 Seventh Ave., New York City, will be glad to send to those interested complete information in regard to Acqua-Pruf, a concrete accelerator and hardener which has an affinity for portland cement and which enable walks, paving, etc., to be opened to traffic in 24 hours.

A Tractor Dump Wagon

156 The Camel, a combined truck, tractor and bulldozer with a 5-cubic yard capacity and mounted on crawlers, steel wheels or pneumatic tires, is described in an illustrated folder which the Shunk Manufacturing Co., 100 Auto Ave., Bucyrus, Ohio, will be glad to send on request.

General Purpose Motors for Construction Equipment

157 Complete information in regard to the Lauson LA-815 1¼-1½ horsepower air-cooled general purpose motor as well as the complete line of general purpose motors and Lauson vertical and horizontal engines may be secured by writing the Lauson Corp., 100 Ogden Ave., New Holstein, Wis.

Road Rollers for Highway Work

158 Complete information in regard to Hercules rollers, their construction, performance and durability, may be secured by interested highway contractors from the Hercules Co., Marion, Ohio.

Concrete Surfacers

159 Complete information in regard to Tousley concrete surfacers for hard and soft concrete may be secured by those interested from the Tousley Tool Co., Cleveland, Ohio.

Tar Heaters

160 Literature describing the complete line of Honhorst tar heaters, in portable and stationary models from 25 to 200 gallons in capacity, as well as Pamphlet No. 15, describing the new oil burning heater, may be secured by those interested from the Jos. Honhorst Co., 1016 W. 6th St., Cincinnati, Ohio.

Calcium Chloride for Curing Concrete

161 Complete data on calcium chloride for curing concrete, the use of which produces a hard wearing surface and makes it possible to open the pavement to light traffic in a shorter time, may be secured from the Dow Chemical Co., Midland, Mich., the Columbia Alkali Co., Barberton, Ohio, or Solvay Sales Corp., 61 Broadway, N. Y.

Elevating and Conveying Machinery

162 A 100-page catalog describing the complete line of standard and special elevating and conveying machinery for practically every purpose has recently been published by the Fairfield Engineering Co., Marion, Ohio, who will be glad to send copies to interested contractors on request.

Convertible Batching Plants

163 Butler material weighing and batching equipment, which is so designed that with changing specifications the addition of a partition converts a two-compartment bin into a three and a few simple changes can convert the weighing hopper from a two to a three-material hopper, is described in Bulletins 200-A and 150-C which the Butler Bin Co., Waukesha, Wis., will be glad to send on request.

A New Roadside Torch

164 The Cleveland flaming torch, a torch of new design which offers protection, unusual durability, full long-time visibility and is economical in cost and upkeep, is described in literature which the Consolidated Iron & Steel Co., 1292 East 53rd St., Cleveland, Ohio, will be glad to send on request.

Rust-Resisting Corrugated Culverts

165 Gohi Culvert Manufacturers, Inc., Newport, Ky., will send to those interested complete information in regard to Gohi corrugated culverts, which are made of pure-iron-copper alloy and which meets the copper-bearing pure iron requirements of accepted specifications for corrugated metal culverts.

Blocks for Manila or Wire Rope

166 Catalog C. E. describing Anvil Brand blocks for manila or wire rope which offer strength, service and safety and which are made in all standard sizes and styles, may be secured by interested contractors from the Western Block Co., Lockport, N. Y.

All-Steel Adjustable Road Guards

167 Literature describing the McCurdy all steel road guards, which are adjustable, collapsible, easily transported from one job to another and make it an easy matter to close a street while repairs are going on, may be secured by those interested from the McCurdy Steel Products Co., Ada, Ohio.

Dependable Power for Construction Equipment

168 LeRoi Co., Milwaukee, Wis., will be glad to send to those interested complete information in regard to its line of LeRoi engines, which are steady, dependable, efficient and made of high quality materials.

A New Pipe Line Trencher

169 Complete information in regard to the new Parsons Model 35 trencher, among the features of which are an additional three-speed transmission, new heavy-duty Koehring type cast steel crawlers, a wider conveyor belt, a 3-foot longer, stronger frame and an increased operating range and speed of excavation, may be secured by those interested from the National Equipment Corp., N. 30th St. and W. Concordia Ave., Milwaukee, Wis.

A New Elevating Grader

170 The new Western No. 6 elevating grader which has a frame that will withstand the twisting strains from the heavy load on the carrier and which utilizes the full power of the tractor for plowing, is described in Bulletin W-31-B which the Austin-Western Road Machinery Co., 400 No. Michigan Ave., Chicago, Ill., will be glad to send on request.

A Hammerhead Boom for Steel Erection

171 A new hammerhead boom for use with crawlers in steel erection, which is provided with sheaves for a five-part line and is designed to keep the load away from the boom structure, has recently been announced by the Northwest Engineering Co., 28 East Jackson Blvd., Chicago, Ill. Complete information may be secured from the company.

(Cut or tear along this line)

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when you buy a *new* WILLIAMS "Champion" Bucket. Important improvements add to this bucket's efficiency. Tandem power-arm sheaves give a *straight line* closing pull, conserving power.

Write for Bulletin J, and look over the Fastest and Most Powerful bucket built.

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WHEN YOU UNDERSTAND SIMPLICITY ASPHALT PLANTS YOU WILL HAVE NO OTHER
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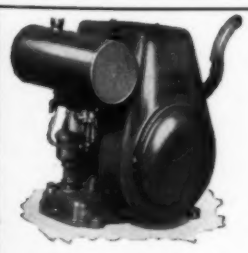
CHATTANOOGA TENNESSEE
SIMPLICITY · DEPENDABLE · SIMPLICITY · DEPENDABLE

72 pages of helpful hints and illustrations pertaining to cut-and-fill work, levee, dam and reservoir construction, etc.

How to Cut Dirt-Moving Costs

SAUERMAN Drag Scrapers can cut your overhead charges and put you in a position to bid lower on long range work. Send for the new Scraper Handbook (shown at left) and see for yourself how a Sauerman machine, operated by one man, has saved money on a multitude of jobs by serving as excavator and conveyor combined.

SAUERMAN BROS., INC.
464 S. Clinton Street . . . Chicago



LAUSON
LA-815
1¼-1½-hp.
Air-Cooled

This Lauson 4-cycle General Purpose Motor is also furnished in the water-cooled type equipped for circulating water, radiator or tank cooler.

MANUFACTURERS
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There are 8 sizes of General Purpose Motors from ½ to 1½-hp. Also other Lauson Vertical Engines, from 1½ to 3-hp.; and Horizontal Engines from 1½ to 18-hp. Write for details on the complete Lauson Line.

THE LAUSON CORPORATION 100 Ogden Avenue New Holstein, Wis.

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LIFEKOTE
UNICRETE

The universal floor surface for Industrial, Commercial, Educational and Institutional Buildings

Applied over concrete or wood, for Trucking Isles, Ramps, Stair Treads, Corridors, Reservoirs, Swimming Pools, Parking Roofs, Etc. Write for pamphlet.

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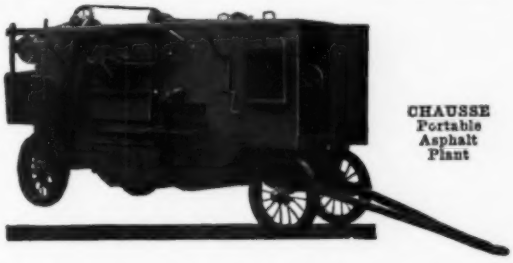

CHAUSSE Portable Asphalt Plant

Philadelphia Repairs Macadam Streets With a CHAUSSE Portable Plant

Almost any type of street pavement can be repaired economically and efficiently with a Chausse portable asphalt plant, the most modern unit. Asphalt, brick, concrete, oiled roads, macadam can be easily maintained.

Philadelphia uses one in repairing 1,300,000 square yards of macadam in Germantown and Chestnut Hill suburbs, an area of about 25 square miles. Why not have one in your city?

Other products—Oil Burning Surface Heaters, Fire Wagons, Tar Kettles, Concrete Mixer Heaters, Kerosene Torches. Write for illustrated catalogues.

Chausse Oil Burner Company
Elkhart Indiana

All-Steel Hand Hoists

172 A descriptive circular containing full information in regard to Beebe all-steel hand hoists, which have a straight-line capacity of 5 tons, weigh 110 pounds and have two speeds, 4 to 1 and 24 to 1, may be secured from Beebe Bros., 3219 First Ave., So., Seattle, Wash.

A New Machine for Concrete Road Work

173 The Conveying Weigher Co., 90 West St., New York City, will be glad to send to those interested a complete description of the new Conweigh tractor conveyor, a machine designed to simplify the carrying and spreading of concrete and which can be used for placing concrete on roads or for pouring side walls for buildings or retaining walls.

A Waterproof, Resilient Floor Material

174 A pamphlet describing Lifekote Unicrete and its use for floors for industrial, commercial, educational and institutional buildings, may be secured on request from the Union Products Co., Cleveland, Ohio. This material may be applied over old concrete or wood floors.

A New Skip Mixer

175 Fairbanks Morse & Co., 900 South Wabash Ave., Chicago, Ill., will be glad to send to those interested a complete description of its new skip mixer scale, a weighing machine designed to proportion accurately aggregates for concrete mixes.

A Lubricant for Construction Equipment

176 Complete information in regard to D-A lubricant, a semi-fluid lubricant for tractors, trucks, cranes, shovels and other heavy-duty equipment which protects gears and bearings, prevents friction and wear and keeps equipment on the job, may be secured by those interested from the D-A Lubricant Co., Inc., Indianapolis, Ind.

A Portable Asphalt Plant

177 Chausse Oil Burner Co., Elkhart, Ind., will be glad to send to those interested illustrated catalogs describing the Chausse oil burning portable asphalt plant for repairing asphalt streets or resurfacing brick and concrete.

A Complete Line of Road Rollers

178 Buffalo-Springfield road rollers, in a wide range of sizes, steam or motor-driven, three-wheel or tandem style, for use in highway construction and maintenance are described in an illustrated booklet which may be secured from the Buffalo-Springfield Roller Co., Springfield, Ohio.

A Complete Line of Hoists

179 Literature describing the complete line of Dake hoists, gasoline and electric-driven from 2 to 27 horsepower, which are dependable, sturdy and low in operating costs may be secured from the Dake Engine Co., Grand Haven, Mich.

A New 1¼-Yard Shovel-Dragline-Clamshell-Crane

180 Bulletin No. FGA-31 describing the new Bucyrus-Erie GA-3 Gas and Air 1¼-yard shovel-dragline-clamshell-lifting crane as well as explaining the principal of Gas and Air and the many improvements in this new model may be secured by those interested from Bucyrus-Erie Co., South Milwaukee, Wis.

Emulsion Spraying Equipment

181 The Littleford emulsion spraying equipment for asphalt emulsions, cut-back asphalt, road oils, silicate of soda and weed exterminators, is described in Bulletin No. G5, which may be secured on request from Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio.

Oil-Burning Rivet Forges

182 Oil-burning rivet-heating forges which produce hot rivets in 3 minutes after starting cold and which can be regulated to properly heat rivets from the largest down to the smallest sizes at the speed at which they are being used, are described in Sheet No. 351, of the Hauck Manufacturing Co., 126 Tenth St., Brooklyn, N. Y.

Hydraulic Power Hoist for Intermediate Trucks

183 Form 101 of the Superior Body Corp., Marion, Ohio, describes the Superior power hoist, a 5-inch underbody heavy-duty hydraulic hoist which is shipped complete ready to mount with wood sills and equipped with a power take-off, body hinges and all parts necessary for installation.

A New Elevating Grader with Engine-Drive Belt

184 Caterpillar Tractor Co., Peoria, Ill., will be glad to send to those interested literature describing the new Caterpillar Sixty elevating grader which consists of a powerful engine to drive the belt and a plow to roll up the earth mounted for hauling by a Sixty tractor.

Complete Bulk Cement Handling System

185 A complete bulk cement handling plant, consisting of an adjustable steel frame 12 x 24 feet in size which contains a scale and three movable chutes which travel between two tracks which carry Turn-Lo cement carts, has been developed by the George O. Harm Co., Warren, Ohio, and is described in literature which may be secured on request.

A Self-Locking Nut and Bolt

186 A self-locking screw thread that locks by reason of the profile of the thread, has been developed by the Dardelet Threadlock Corp., 120 Broadway, New York, and is described in literature which may be secured on request.

High Pressure Triplex Road Pump

187 Bulletin RUP-31 of the Domestic Engine & Pump Co., Shippensburg, Pa., describes the new high pressure triplex pump consisting of a Domestic Model 56 pump equipped with a pressure control regulator, a suitable gasoline engine and a truck.

A High Capacity Pressure Line

188 The Lock Joint Pipe Co., Ampere, N. J., has issued an interesting, well-illustrated booklet describing the installation of the 26 miles of force main to convey a newly developed supply of fresh water to St. Petersburg, Fla. The pipe was manufactured and the pipe line built by this company.

A New Revolving Tractor Scraper

189 Complete information in regard to the new RC Groundhog revolving tractor scraper which is adaptable to a variety of working conditions, is automatic or rope-controlled, operates with any type or make of tractor and is made in 4 and 5-foot sizes, may be secured by those interested from Farm Tools, Inc., Dept. 74, Mansfield, Ohio.

High Speed Bituminous Distributor

190 Bulletin No. 91 of Chas. Hvass & Co., Inc., 508 East 19th St., New York, describes the Hvass Type 100 S bituminous distributor which has a low center of gravity which is of great importance in high speed transportation and permits carrying large capacity equipment on short wheelbase chassis.

Asphalt Plank Flooring

191 Safe-T-Plank is a dense hard, tough composition of asphalt, fiber and mineral matter with no felt used for reinforcing, manufactured in slabs or units of convenient dimensions and easily laid by common labor with ordinary tools, made by the Flintkote Co., Park Square Bldg., Boston, Mass., who will send complete information on request.

A Fully-Convertible ⅜-Yard Shovel

192 The Speeder Whirlwind, a fully-revolving, fully-convertible ⅜-yard shovel which is built for high speed in all operations, weighs only 10 tons and features the Speeder double drum cable crowd is described in literature which the Speeder Machinery Corp., Cedar Rapids, Iowa, will be glad to send on request.

Portable and Stationary Bulk Cement Plants

193 Form 1214 of the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Pa., describes the two types of equipment for handling bulk cement, a portable type and a stationary type, offered by this company.

Portable Carbide Lights

194 The Handy-Light, a carbide light with an enclosed flame which is particularly handy for emergencies and for non-stationary outdoor operation, is described in literature which may be secured on request from the National Carbide Sales Corp., Lincoln Building, New York.

A Dripless Valve

195 A dripless valve which operates on the solenoid principle for weighing water at concrete plants, has been designed primarily for use with the Toledo scale electric cut-off weighing device and perfected by Toledo Precision Devices, Inc., a subsidiary of the Toledo Scale Co., Toledo, Ohio. Complete data is available on request.

Boring Machine for Small Pipe

196 Complete information regarding the boring machine developed by the Armco Culvert Manufacturers Assn., Middletown, Ohio, for installing corrugated iron drain pipe in 8, 12 and 18-inch diameters under highways and railroads without disturbing the traveled surface, is available on request from the Association.

A Bituminous Distributor

197 A separate engine-driven pump type of distributor for the application of all grades of oil, tar and asphalt used for bituminous road construction and maintenance, known as the Etnyre Model F distributor, is described in Catalog No. 503 of E. D. Etnyre & Co., Inc., 85 Jefferson St., Oregon, Ill.

New Dump Hoist for Light Trucks

198 A hoist and body unit for light-duty trucks, known as the WB dump unit, has been announced by the Heil Co., Milwaukee, Wis. Complete information may be secured from the manufacturer on this unit which consists of a No. 1 Heil single-cylinder hoist mounted in a channel iron supporting frame which fastens to the chassis frame with clips; a Heil power take-off and an all-welded steel body.

A Stronger and Waterproof Cement

199 Super cement, a variety of portland cement which is made from portland cement clinker by grinding in with it treated gypsum in order to make a stronger and waterproof cement is manufactured by the Super Cement Co., Detroit, Mich., who will be glad to furnish full information on request.

An Automatic One-Man Tractor Scraper

200 Literature describing the Schaefer automatic one-man tractor scraper for earth moving, grading, excavating, spreading and land leveling which does accurate work, is directly controlled from the tractor seat, and is made in four sizes, may be secured by those interested from the Gustav Schaefer Co., 4180 Lorain Ave., Cleveland, Ohio.

Portable Air Compressors

201 The Buhl Co., Old Colony Bldg., Chicago, Ill., will be glad to send to those interested its new 16-page catalog describing and illustrating the complete line of Buhl portable compressors in the various styles and sizes to meet contractors' requirements.

A New Cab for Shovels and Cranes

202 Complete information in regard to the new Lorain 6-point cab for shovels and cranes, the features of which are appearance, accessibility, visibility, ventilation, protection and safety, may be secured by those interested from the Thew Shovel Co., Lorain, Ohio.

A New Reduction Crusher

203 Bulletin No. 110, describing the new reduction crusher known as Type TZ, which is built in six sizes capable of hourly production ranging from about 15 tons, ½-inch ring size, in the smallest machine to nearly 1,000 tons, 2½-inch ring, in the largest size, may be secured by those interested from the Traylor Engineering & Manufacturing Co., Allentown, Penna.

An Hydraulically-Operated Machine for Road Building

204 The Wooldridge Manufacturing Co., Los Angeles, Calif., will be glad to send to those interested literature describing the tractor-mounted, hydraulically-operated, reversible-blade Trailbuilder for use in trail and road building, bulldozing, leveling and similar work.